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TELEPHONY REACHES, WEEKLY, EVERY TELEPHONE BUYER IN THE FIELD

Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Sound Waves, Telephone Magazine, and The Telephone
PUBLISHED WEEKLY BY THE TELEPHONY PUBLISHING COMPANY, MONADNOCK BLOCK, CHICAGO

VOL. XVI. No. 19
CHICAGO, DECEMBER 19, 1908
10 CENTS PER COPY
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1889 Paris Exposition Medal for Rubber Insulation — 1893 World's Fair Medal for Rubber Insulation
OKONITE TRADE MARK REG U.S. PAT. OFFICE
The Standard for Rubber Insulation
OKONITE WIRES, OKONITE TAPE, MANSON TAPE, CANDEE PAT'D POTHEADS
THE OKONITE CO., Ltd. Sole Manufacturers 253 Broadway, New York
WILLARD L. CANDEE, H. DURANT CHEEVER, MANAGERS — W. H. HODGINS, SECRETARY — GEO. S. MANSON, SUPERINTENDENT — W. C. CANDEE, ASS'T SECRETARY
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CLAY PRODUCT COMPANY
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GEO. NASH CO.
NEW YORK 217 Pearl treet — IRON STEEL — CHICAGO 115 Washington Blvd.
STEEL SPECIALTIES
COLD ROLLED AND COLD DRAWN STEEL
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"CAPITAL" HIGH SPEED STEEL & TWIST DRILLS
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LARGE STOCK ON HAND—SEND FOR CATALOGUE

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KERITE
Insulated Wires and Cables
1850 — DAYS — KERITE — 1908
The Insulation which has withstood successfully the test of half a century
W. R. BRIXEY, Sole Manufacturer
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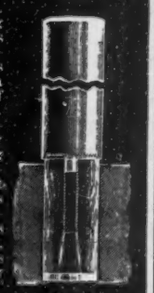
30 Church Street, NEW YORK

CHICAGO TELEPHONES SATISFY
CHICAGO TELEPHONE SUPPLY CO.
FACTORY AND GENERAL OFFICES
ELKHART, IND. U.S.A.

Metropoliton Expansion Plugs
(Creosoted)

The cheapest and most efficient method for making wall connections. The holding power of this plug is enormous and is suitable for a great variety of work. Cut No. 1 shows a perspective view of the plug with screw inserted. Cut No. 2 shows plug being driven in by means of driving tool. Peg expands plug as latter is driven in. Sizes 3/8" and 1/2" diameter.

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Yonkers Specialty Co.
YONKERS, N. Y.

"DETROIT" RUBBER COVERED WIRES
Telephone Pair a Specialty
DETROIT INSULATED WIRE CO.
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Wire, Sheet, Rivets and Contacts
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TELEPHONE CABLE
WATERBURY CO., 69 SOUTH STREET, NEW YORK CITY

ALPHABETICAL INDEX TO ADVERTISEMENTS ON PAGE 22

1908-Lease Records-1909

Send for our "Newform." The best companies all use it, and re-order year after year.

Our **Improved Cash Book** is just out and going fast. The most valuable form yet devised for keeping detailed Telephone Accounts simply and accurately. Used and approved by best Telephone Accountants.

Our Books, Blanks and Forms for Telephone and Toll Line Accounting are "Standard" and used more than any other. Write for sample forms and prices.

THE TELEPHONE PRINTING COMPANY
DEFIANCE, OHIO

The Indiana Rubber & Insulated Wire Co.

MANUFACTURERS OF

Insulated Wires and Cables

JONESBORO, IND.

Operators --- Managers

Mantles are strong, will not break
Standard chimneys used

Wick does not burn, only vapor.

Here is a Money Maker

A KEROSENE LAMP BURNER BURNS A MANTLE JUST LIKE GAS

The cheapest, best, safest and most reliable light in the world. One burner equal to six incandescent lamps. Ten times more light out of same oil than with other burners fitted to any lamp. No pumping, no chemicals. Just common kerosene. Just what you want at Central. Every home needs one or more. Get busy. Write for agency. Order sample by mail. **$2.35** sells for $4.50. Worth $50.00. Guaranteed satisfactory.

IDEAL LAMP DEP'T
Acorn Brass Mfg. Co.
53 N. Peoria St., Chicago

SKY ROCKET LIGHTNING ARRESTERS

The BEST Non-Attention Type ARRESTER on the Market.

MOORER RE-ACTANCE ARRESTER
has a Flat Re-Actance Coil made Fuse Shaped.

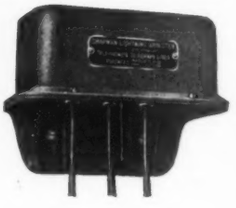
This ARRESTER ARRESTS. Extra coils, should coils burn out, furnished at 2½ cents each.

THE "400 COMPANION"
converts your old 400 into an up-to-date Choke Coil Arrester at a cost of **only 25 cents.**

Test Racks, Test Panels, Tie Wire Formers, and many other Good Things.

Write the **Chance Manufacturing Company**
Centralia, Mo.

Dreadnaughts of the line



Armored with 14 gauge steel and impervious to moisture,

CHAPMAN LIGHTNING ARRESTERS

can be stationed at strategic points and be depended upon to keep open your lines of communication.

MINNESOTA ELECTRIC CO.
MINNEAPOLIS, MINN.

The Wire o Quality

TELEPHONE WIRE

Best by Every Test

A Difference in Wire makes a Difference in Service.

LONGEST LIFE—HIGHEST EFFICIENCY

Universities have tested our wire and found it of the highest quality. Leading Telephone Companies use it, with perfect satisfaction in most exacting service.

Write for Samples and Prices Today

Handled by Representative Jobbers and Supply Houses

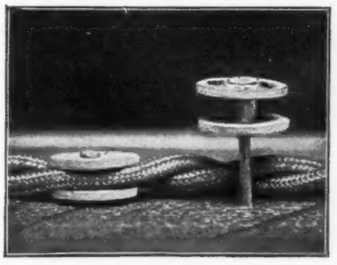
INDIANA STEEL & WIRE COMPANY
MUNCIE, INDIANA

Eureka Fibre Insulators

A NEW STYLE

"PRICES TO POINT, WHERE IT IS ECONOMY TO USE THEM"

The value is in the method that they are attached without injury to the wire.

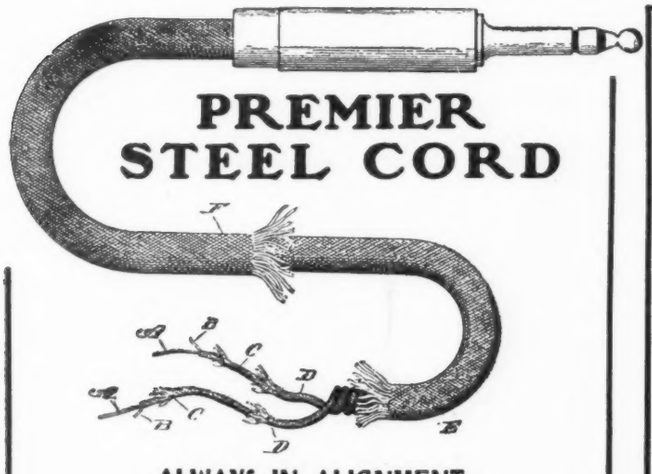


Made in Three Types
50, 60, 70
¾", ⅞", and 1" long respectively.

PRICES AND SAMPLES ON APPLICATION

COMMERCIAL ELECTRICAL SUPPLY CO.

Fifteenth and Pine Streets ST. LOUIS, MO.



PREMIER STEEL CORD

ALWAYS IN ALIGNMENT

In the hollow of the cord at the plug end, there's a reinforcing spring made of the highest grade spring steel. Not only does this prevent the conductors from being thrown out of alignment, but it also makes it practically impossible to break the cord at the plug end, and that's where the strain is greatest. Operators don't have to be careful when you use Premier Steel Cord—it'll last in spite of shamefully careless usage. Better get details.

Runzel-Lenz Electric Mfg. Co.
97-101 South Clinton Street, Chicago

Five Men on a 95 cent PEIRCE SEAT

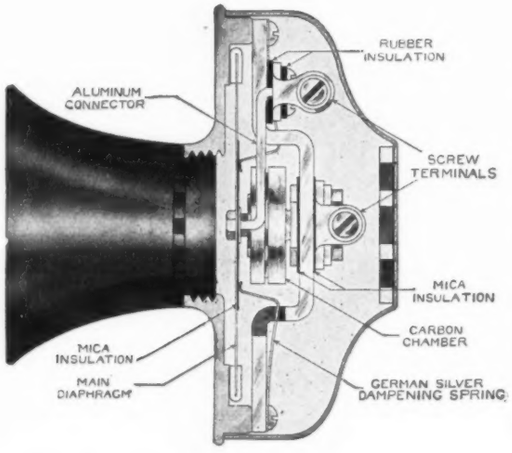
We make six designs of seats, three all steel and three with wood seats.

Get circulars.

Peirce Specialty Co.
ELKHART, IND.

Cracraft, Leich Transmitters

ARE GIVING UNIVERSAL SATISFACTION



Not one single complaint has been received by us from the users of the many thousands of Cracraft, Leich transmitters now in actual service, but on the contrary, we have a great many letters in our files telling us about the satisfactory service they give.

We are proud of this record, and will gladly send a sample transmitter for general inspection and test to reliable parties.

Write for Advance Bulletin of Magnet telephones.

Cracraft, Leich Electric Co. **Genoa, Ill.**

NEW—AND—GOOD

Crown Metal Telephone

Guaranteed Perfect Mechanically and Electrically

Attractive in Design and Finish

Made of Pressed Steel (or Brass) and Finished in Nickel, Copper Oxidize or Japan.

Useful for Connection Between

Your office and wareroom.
Your neighbor's house and your own.
Your house and your stable.
Your kitchen and servant's room—
or any other two points.

SPECIAL CLAIMS

1st—Being of metal, these telephones will not shrink in dry places or swell in damp places.
2nd—They are as near perfection as human ingenuity can make things.
3rd—They are the cheapest high grade telephones ever offered on the market.

If interested in any other Interior Telephone Apparatus, write us for information. We believe that our facilities, workmanship, materials, prices and products can not be duplicated.

DEALERS WRITE FOR DISCOUNTS

The Standard Mfg. Co.
BRIDGEPORT, CONN.

If You Consider THE POOLE

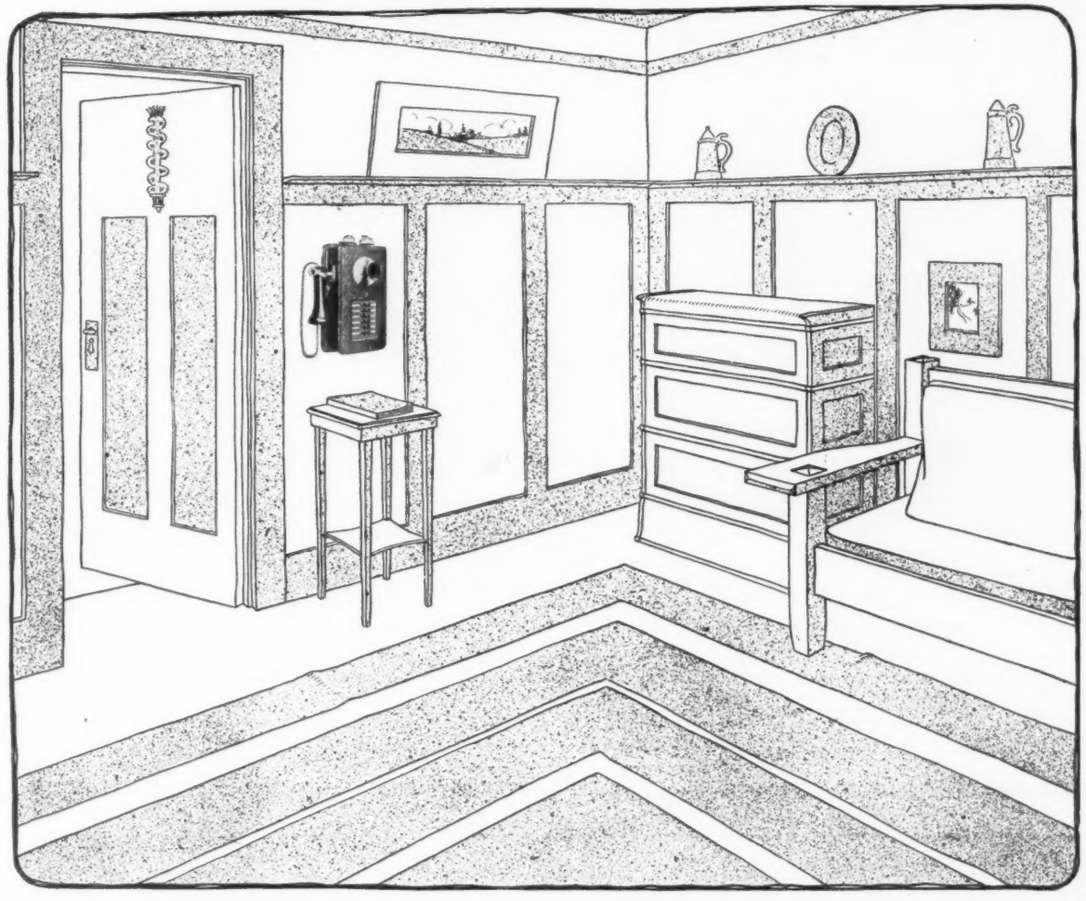
Lock-Out System

as an addition to party-line service, you are wrong. It is not something added—it is a feature which has always belonged to good service. It unfailingly gives absolute

SECRECY

to any of the parties on the line. It gives the subscriber all the advantages of a private line at the cost of a party line. It enables you to put more parties on a line, and get higher rates.
Now, do you want details?

Mountain State Electrical Co.,
Wheeling, W. Va.



INTERCOMMUNICATING TELEPHONE SYSTEM FOR RESIDENCE USE

The value of such a system cannot be overestimated—it will increase to a remarkable extent the capacity of a hotel, apartment house or club and will enable its members to do in an easier manner, a larger volume of work and in a shorter space of time. The organization that would steer its enterprise to success nowadays must take advantage of every "short cut" possible and must avail themselves of every means of saving time, for saving time is saving money and means the difference between profit and loss. Of all money savers for the property owners, a "Stromberg-Carlson" Intercommunicating Telephone System is the greatest.

Both "Stromberg-Carlson" wall and desk type instruments are furnished equipped for 10, 20 and 30 local stations, with an extra button for a trunk line to a distant exchange. These neatly finished and handsomely designed Intercommunicating Telephones are practical and purposely designed for this service. Right quality—compact construction and improved method of operation will convince you of "Stromberg-Carlson" superiority.

Let us give you further particulars—Booklet No. 166.

STROMBERG-CARLSON TEL.MFG.CO.

ROCHESTER, NEW YORK, U.S.A.

CHICAGO, ILL. KANSAS CITY, MO.

The New DeVeau All Metal Telephones

Equipped with Exchange Button
This Quartet has No Equal

BALL BEARING

Cat. No. 157

All metal. Ball bearing mechanism. Common return or metallic circuits. All inside terminals. Black rubber finish mounted with nickle trimmings.

Patented March 21, 1899
Patented July 18, 1905
Other patents pending

Cat. No. 1173

Cat. No. 1172

All metal. Black rubber finish mounted with nickle trimmings. Removable switch hook. Clip cover easily removed. Knockout holes on each end for cable.

Send for our descriptive pamphlets

MANUFACTURERS OF AUTOMATIC SWITCHLESS TELEPHONES
DE VEAU

Cat. No. 126

DeVeau Telephone Mfg. Co. 471 18th Street Brooklyn, N. Y.

Our "Jolly Good Fellow"

Continues to be in great demand

MERIT

POPULARITY

Open View No. 50

Answer:—STANDARD instruments are made from the best of raw material by the most expert workmen obtainable according to the designs of highly competent engineers. Are you getting satisfaction? The best Magneto telephone is spelled STANDARD.

The Standard Telephone Mfg. Co.
Portsmouth, Ohio
Successors to The Williams Telephone & Supply Co., Cleveland, Ohio.

RELIEF FROM RUBBERNECKS

Andrae "Ring Three" Condensers enable you to ring right by the station that has its receiver off the hook "listening in."

The principal trouble on party lines is the ringing. Sometimes a call goes through, sometimes part of it goes through, and sometimes it does not go through at all.

Many rural subscribers cannot resist the temptation to "listen in." This listening puts a low resistance across the line and picks up the current that should go to the ringer and subscribers and operators wonder why calls are not answered and bells do not ring. Put an Andrae "Ring Three" Condenser on each telephone and bells will ring in spite of the rubbernecks. Ten minutes time and a screwdriver will do the work.

Write for our free trial offer.

Julius Andrae & Sons Co.
217 W. Water Street
MILWAUKEE

An Opportunity

For Independent Telephone Operators

If You Believe in the Independent Telephone Field You will be Interested in this Proposition

A leading manufacturing establishment—widely advertised and producing the only successful apparatus yet devised for one of the greatest and most profitable branches of the Telephone industry—offers for sale a limited amount of stock in order to increase its facilities as required by the company's rapidly growing business.

The apparatus now being manufactured by this company has "Made Good" beyond any question. It has won its way into the most conservative Telephone systems of America and fills a field absolutely unique and where the demand is almost limitless.

The best engineers in the industry pronounce it perfect as well as revolutionary in its scope.

There can be no question about the safety of this investment nor about the future increase in value or dividends on your stock. We can refer you to the best people in the Telephone business as to our veracity and responsibility.

The idea is this: We have done all the experimental work, covering a period of seven years; we have built our own apparatus, and have it in actual operation in many prominent systems where it has fulfilled every requirement.

What we want now is additional capital for the manufacture of this apparatus on a scale commensurate with its merits and the demand it already has created. This will insure another big success for the Independent field. Are you or any of your friends interested? If so, be sure to write today and the proposition will be explained fully.

Address, MANUFACTURER

Care of TELEPHONY, Chicago

We shall ask no one to subscribe for a dollar's worth of this stock unless we can first satisfy them absolutely concerning the merits of our apparatus and the value of this proposition. We refer, by permission, to Telephony Publishing Company as to our veracity and responsibility.

THE ROBERTS SYSTEM

Will increase your net revenue

50%

Without increasing cost of maintenance
We are doing it for others
Why not let us do it for you?
Are you interested? Write for particulars

Homer Roberts Telephone Co.

1703 Melrose Street, Chicago, Illinois

One Piece Shells

Receiver Shells and Mouth-pieces

YOU'VE **got** to replace shells and mouth pieces. You **want** to cut down the **cost** of doing so. You **can** economize by buying from me. I'll save you money on shells and mouth pieces for **all** makes of telephones, and ship all kinds in one lot.

ASK FOR PRICES

F. W. PARDEE

52 Fifth Avenue :: CHICAGO

TRUMBULL TELEPHONE SWITCHES

AT GREATLY REDUCED RATES

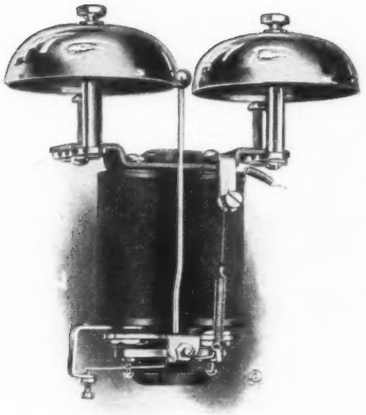
Self-adjusting clips held firmly in the recesses in the base insure a proper alignment and prevent loose, resistance introducing contacts. Selected high-grade porcelain only used for bases. Each switch undergoes thorough test and inspection before leaving our factory.

THE TRUMBULL ELECTRIC MFG. CO.

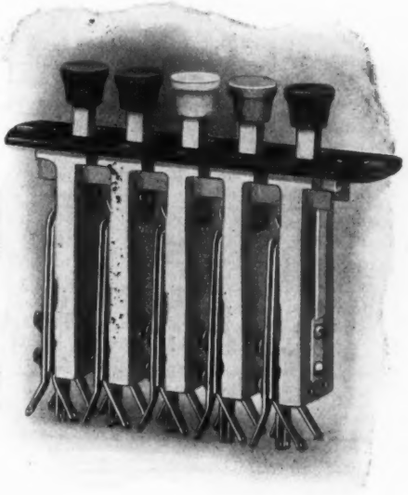
NEW YORK 136 Liberty St. PLAINVILLE, CONN. BOSTON 65-67 Oliver St.

The First Copy
OF OUR
Bulletin No. 6
Brought in an Order

¶ This Bulletin explains the Direct Current Selective System so thoroughly that even the objectors to selective systems are convinced that this one will succeed where others fail.



Here are the most complicated parts of the system —a ringer operating on the principle of a vibrating bell and a selecting key which is extremely reliable.



¶ No pole changer or other ringing device is necessary—merely a set of dry batteries and a couple of resistance coils.

¶ After you read our Bulletin No. 6 you will understand why this is the most economical system to install and operate.

¶ There are no parts requiring delicate adjustment and bell interference is positively eliminated.

MONARCH TELEPHONE

MANUFACTURING CO.

Washington and Morgan Streets, CHICAGO

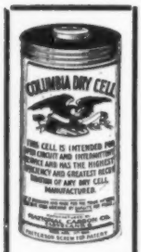
177 Main Street :: :: :: :: DALLAS, TEXAS

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Patterson Wireless Dry Battery Holder

and "SCREW TOP" CELLS are Invaluable in The Telephone Field

NO BINDING POSTS! NO CONNECTING WIRES!



Patterson Screw Top Cell

For as long as you can remember, you have thought of Battery Cells being connected up with **wires to Binding Posts!**

Perhaps it's occurred to you that the method was a **crude** one, but, perhaps, more than likely on the other hand, you've never given the subject much attention—certainly never appreciated how **really crude the Binding Post method was!**

The Patterson Screw Top Type Battery Cell, which is now regularly manufactured by the leading dry battery manufacturers of the country, will appeal to every telephoneman in the country as **Ideal!**

Really it's the **logical, common sense way of doing,** and before long the Binding Post type of dry battery must appear as **"out of date"** as a wire-terminal lamp for commercial use would to-day seem!

Patterson Screw Top Type Battery Cells are made like cut shown above, with no projecting Binding Posts or carbons; they are mechanically and electrically correct for **every purpose where a Battery Cell is used.**

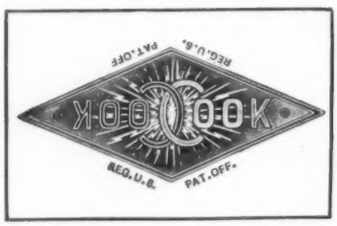
STANLEY & PATTERSON

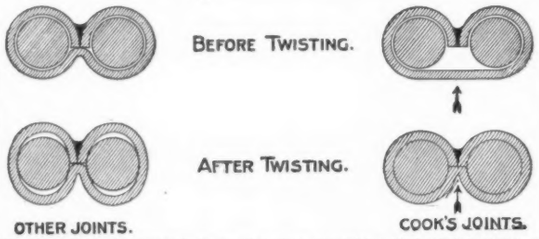
Sole Manufacturers of Holders Only

23 Murray St., NEW YORK

NOTE—Keep on using the **same make** of Dry Cell you like best, but when ordering, specify "Patterson Screw Top' in place of Binding Post cell.
All leading manufacturers of dry batteries will supply this type of cell.

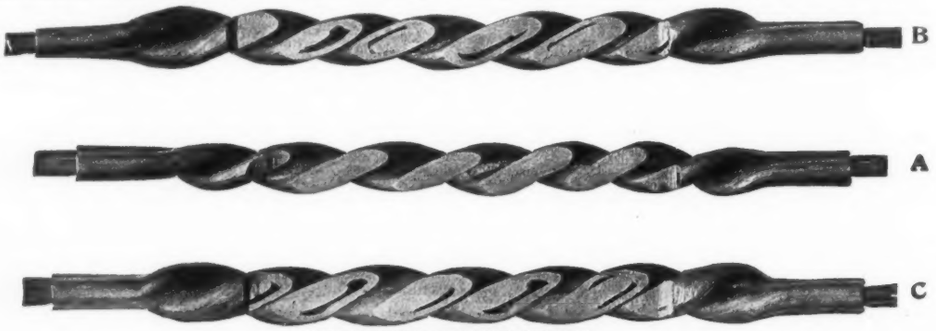
Wall Set Fitted with Local Battery "Screw Top" Equipment





Cook Self-Welding Wire Joint

In the Cook Joint the mere act of twisting draws the sleeve into the recess between the wires, stretching it absolutely tight around both wires, making a perfect self-weld.
A joint made with the COOK SELF-WELDING JOINT is stronger than the wire itself.
When a twisted joint is cut in two it is impossible to see where the metal in the joint ends and the wire begins.
Moisture or air cannot penetrate and corrode the wire and the joint. The Cook Self-Welding Wire Joint insures a permanently perfect connection.



WIRE JOINT COMPARISON

A—Cook No. 10 with 1 No. 10 and 1 No. 12 Wire. B and C—Competitor No. 10 Joint with 1 No. 10 and No. 12 Wire.

The Cook Joint will give perfect results as a combination joint, when the wires used are not more than two gauges apart. All sizes For Copper or Iron Wire, No. 18 to No. 0000

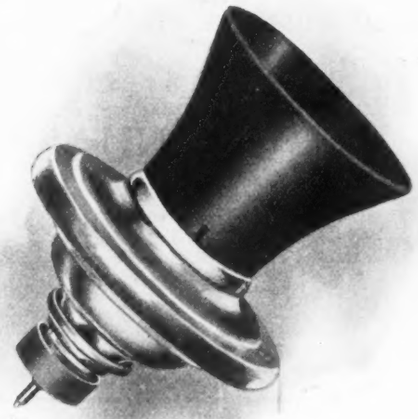
Frank B. Cook.

242 W. LAKE ST. CHICAGO, ILL.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

"THE MARK OF SUPERIORITY"
TRADE MARK

Perfect Transmission



The Goal of Every Telephone Operator

The ONE MOST DESIRABLE feature of the service ALL are struggling to attain.

THE ERICSSON TRANSMITTER is the ONLY TRANSMITTER that has MADE GOOD.

You are offered NEW and so-called IMPROVED transmitters with every change of moon—WHY—because so far no other transmitter offered has done its work satisfactorily. Thousands have been returned and replaced, and still for every new TRY OUT the earth is claimed.

ERICSSON TRANSMITTERS HAVE A RECORD FOR EFFICIENCY AND PERFECT TRANSMISSION.

In ten years we have not been called upon to MAKE GOOD or exchange as many as 100 transmitters.

A RECORD NO OTHER CAN APPROACH

L.M.ERICSSON TEL.MFG.CO.
BUFFALO, N.Y.

REBUILDING

Your competitor (The Bell Company) is using, or may install a common battery multiple switchboard—the highest type of manual equipment.

You should not be satisfied to place yourself merely on an equality with a competitor when you can secure, in the matter of equipment, an undoubted advantage.

The Clement Automanual is your opportunity. Your competitor cannot purchase it.

TRADE MARK

AUTOMANUAL

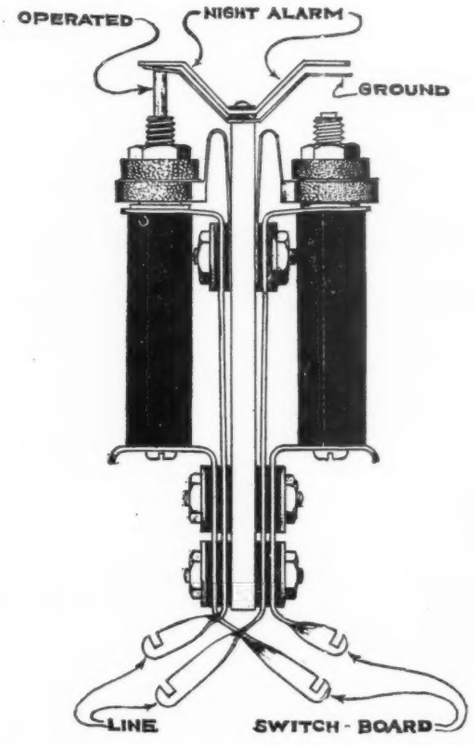
Reg. U. S. Pat. Off.

The North Electric Company

DALLAS CLEVELAND KANSAS CITY

WE CLAIM

That the **American Type H Protector is the Only Absolutely Satisfactory Switchboard Protector Made**



AMERICAN ELECTRIC FUSE CO.

Muskegon, Mich. New York, N. Y.

300 Workmen in Our Factory
"MINDING OUR OWN BUSINESS"

A Card of Thanks

A Prospective Purchaser carefully inspected the convention exhibits of every telephone manufacturer.

Each Competitor of ours took particular pains to show why his equipment was better than Dean.

The Customer became curious and examined our goods with especial care.

He Bought a Dean board because he found that every criticism was based on some exclusive Dean feature.

Which Reminds Us of what the Manager at Deshler, Ohio, told our respresentative:

¶ "The tree with the most clubs around it, bears the best fruit."

The Dean Electric Company
Elyria, Ohio, U. S. A.
San Francisco Kansas City

Please tell the Advertiser you saw his Announcement in TELEPHONY.

"Hard Lines"

The Trudge for Work.

He's certainly to be pitied—the **untrained** man without a job. Just one of the hopeless, struggling crowd.

Every **good** position—requiring special knowledge—is closed against him.

And there's always a line of **others** "waiting to see the foreman" or rushing to answer the advertisement, for the poorest bread-and-butter job.

Just your two hands and your shop experience wouldn't carry **you** far—if slack times should come.

Let your dread for the future stimulate you to do something **now** to improve your chances. Set your mind on the better position you want—and win it.

Don't waste your time "thinking it over"—don't build air castles, just buckle down and do it.

Why not make the start today that will keep you forever out of the hand-to-mouth class? Put in part of the long Winter evenings at home, fitting yourself for a better **kind** of work, and bigger pay.

We can help you. There's always a big demand for men **trained** in Telephone Work and Electrical Engineering. Get a thorough technical training that will fit you to hold one of these well-paid positions—through our simple, practical courses of Home Study. And without loss of time in your present work.

Let the American School of Correspondence tell you how to get more pay now and insure yourself a good position all your life. We employ no agents. Like all strictly educational institutions, we depend upon our usefulness for our growth.

Ask for our advice and the proof of what we have done for 80,000 others. Mark and send coupon—today. We'll send you a valuable book FREE describing our complete courses.

WE HELP MEN HELP THEMSELVES.

AMERICAN SCHOOL OF CORRESPONDENCE

CHICAGO, U. S. A.

FREE INFORMATION COUPON

Clip and Mail Today.

American School of Correspondence:

Please send me your valuable 200-page book of Engineering information and advise me how I can qualify for position marked "X."

....Telephone Engineer	....Heating and Vent. Engr.
....Electrical Engineer	....Plumber
....Draftsman	....Architect
....Civil Engineer	....Hydraulic Engineer
....Mechanical Engineer	....Textile Boss
....Stationary Engineer	....Sheet Metal Pattern Draftsman
....Structural Engineer	....College Preparatory Course
....Municipal Engineer	....Sanitary Engineer
....Railroad Engineer	
....Structural Draftsman	

Name .....

Address .....

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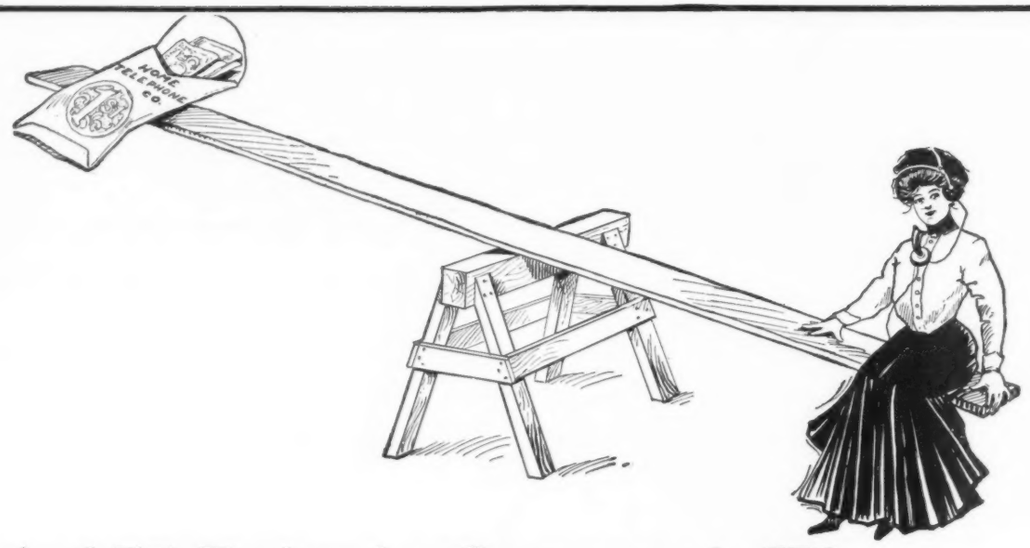

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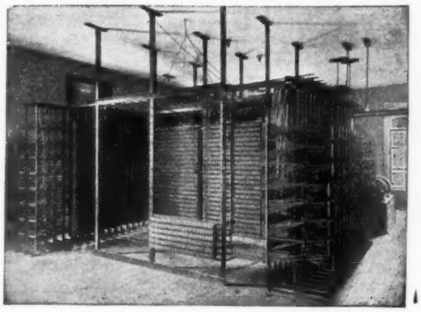

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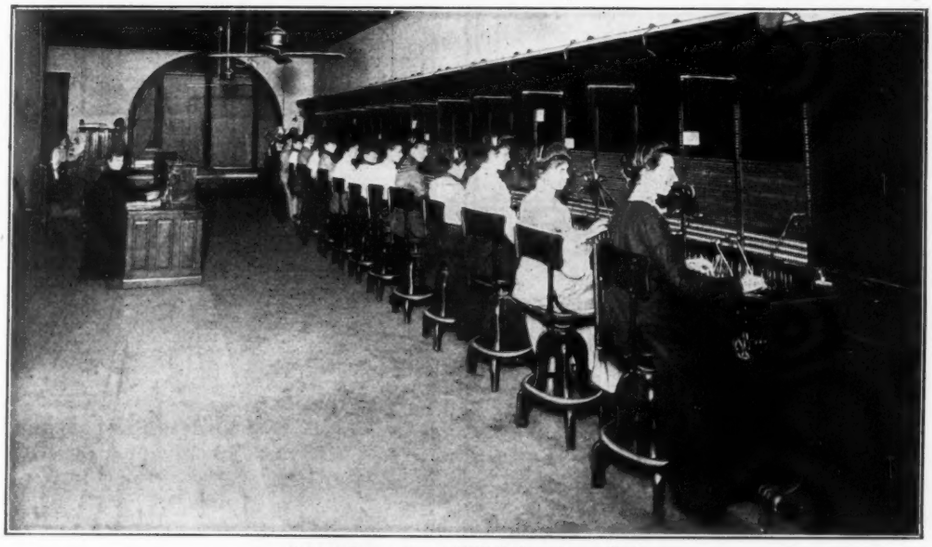

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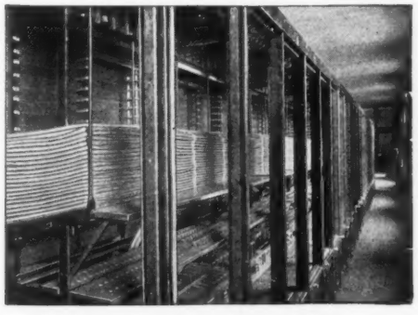

Rear View of Board

Sterling Electric Company

La Fayette - Indiana

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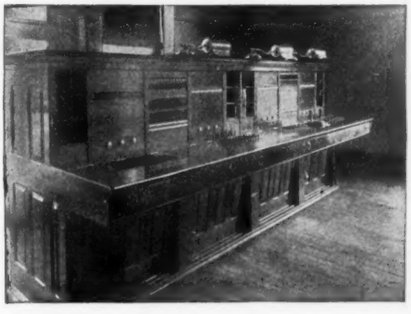

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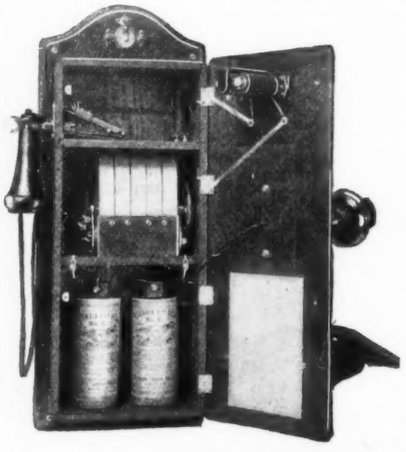

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THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Sound Waves, Telephone Magazine and The Telephone

Vol. XVI CHICAGO, SATURDAY, DECEMBER 19, 1908 No. 19

PUBLISHED EVERY SATURDAY BY THE

Telephony Publishing Company

Monadnock Block, Chicago

Telephone Harrison 2951

H. B. McMeal, President F. S. Kenfield, 1st Vice-President
W. H. Graffis, 2d Vice-President H. D. Fargo, Secretary-Treasurer

Edited by H. B. McMeal and Franklin H. Reed

The present publication comprises

Vol. 55	The Telephone	No. 19
Vol. 32	Telephone Magazine	No. 19
Vol. 18	American Telephone Journal	No. 25
Vol. 16	Sound Waves	No. 19
Vol. 16	Telephony	No. 19

TERMS OF SUBSCRIPTION:

United States, Cuba and Mexico.....per year, $2.00
Other Foreign Countries within the Postal Union..... 3.00

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements accepted up to noon of Monday for the paper dated Saturday of the same week.

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Entered as second-class matter September 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1879.

CHICAGO, SATURDAY, DECEMBER 19, 1908

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Discrimination, Regulation, and Security.

What guarantee does an investor have for the security of his money, and the regularity of returns, if his capital is placed in a telephone business operating in a field where there is prevalent such an inexcusable amount of rate discrimination as seems to have existed in Wisconsin? How can a man go out and try to sell securities on any reasonable basis when the average return per subscriber is likely to be affected by haphazard price-cutting in an effort to outdo a rival in the quantity of low return business obtained?

The condition revealed by the report of the Wisconsin Railroad Commission, just filed with the governor, ought to set some of us to thinking. Nearly a year ago we suggested that governmental regulation of public utility corporations, including telephone companies, is coming as a result of an irresistible public demand, in a great many states. It was pointed out that any telephone company which is in a condition not up to a reasonable standard would do well to start a rapid house cleaning. Now, when it is too late, some of the Wisconsin companies are scurrying for cover. After the publicity their affairs have received, they may have rather a hard time getting out an explanation which will be satisfactory both to stockholders and to subscribers, as well as to the general public. Companies in other states may look upon this as a warning.

In their anxiety to carry on vigorous competition with respect to the extent of service offered, many companies have forgotten one of the main things for which they are in business. Managers have become more interested in securing subscribers than in getting profits, and, in some cases, have kept on adding loads of cut-rate business until the burden has become unbearable; a condition which has developed in more than one company in Wisconsin, and other states as well. Any temporary advantage gained by concessions to individuals is lost by the ultimate unfavorable impression created with the general public, so the whole operation of the process of granting special reduced rates tends to produce losses which are of a most destructive type.

Rate cutting, in order to gain advantages over a competitor, has been practiced in many exchanges, and has caused a loss to the treasuries of telephone companies of many thousands of dollars which have been legitimately

earned, and should have been collected. The presence of such conditions, where they exist, is known to large numbers of the investing community, and discourages people from taking an active financial interest in the telephone business.

The proposition before many telephone companies now is a remedial one. There is no question but that ultimate good will come from the Wisconsin exposure. Much of the alleged discrimination is due to efforts, not courageously and universally exerted, to substitute remunerative charges for rates which, with the growth of the business, have become too low. A fair, able commission can make it possible for a telephone company to go before the public with a just, uniform rate schedule, and receive the support which it deserves. It can prevent rate cutting in spots by a large company, for the purpose of forcing a rival operating in a restricted territory to either do business with all or a part of its subscribers for inadequate rates, or suffer a stunted development. That this latter function of the commission can be performed with vigor and justice seems to be in process of demonstration in Nebraska. It is one which particularly appeals to Independent companies whose rival has practised this type of discrimination so long and extensively, to its own great loss as well as to the damage of its competitors; but it deserves the careful consideration of both parties to the contest.

Prominent telephone men in Indiana and Iowa, where laws establishing public service commissions will probably be passed this winter, see in this feature alone a prospect of sufficient benefits to win their support for the principle of regulation. Even Bell companies, whose securities have suffered by this and other forms of destructive competition, may not be beyond the hope of redemption, and public pressure, resulting from a sufficiently active promotion of publicity for existing evils, would be a potent factor for the prevention of active opposition to a measure which would be for the general good of the telephone business.

Wherever a public service commission is about to be established, it is natural to expect that strong efforts will be made to incorporate in the law sections which will amount to a declaration, and provision for the enforcement of the principle that regulation by a commission is all-sufficient, and the existence of competition is unnecessary. This principle has never been established in any locality, and, in our opinion, cannot be established. Vigorous and well planned efforts should be commenced now to educate the public, and their representatives in governing bodies, to a realization of the fallacy of such a position. We cannot expect them to understand the telephone business by intuition.

While many telephone men are disposed to fight regulation, the leaders of the business are working around to the view that proper regulation would put telephone securities in a firmer position than they have ever occupied. It will give a guarantee which will enable a telephone company to compete in the money market, for funds, with corporations which have hitherto been popularly, even if erroneously, supposed to offer better security for investments.

In some states, local conditions may demand a postponement of the initial attempt at regulation, and no body should be more willing to recognize this fact than the legislature. But, ultimately, regulative laws will be passed, and in order that these shall recognize the value and necessity of competition, and accomplish the result of putting the telephone business on even a firmer basis than it is now, much hard work must be done by Independent telephone men.

Who Is Aunt Mary?

Sometimes things happen that would make any one wonder. For instance, we have heard much about the ingenious press-agent of the "telephone trust." The newspapers from time to time bring out items that make us all wink, or smile, and say: "Aha! Up to his little tricks again. Innocent reading matter with a concealed-obvious point."

That is what we usually say. But one of the latest things has its point so well concealed that,—well, we can only wonder. Here is the occasion—from the columns of the *Southern Farm Gazette*:

"There should be many more telephones in use among farmers, and there will be. * * * It should be seen that when telephones are bought they are the kind that neighboring lines are using.

"We hear and read much against the trusts. * * * Some of the talk is nonsense, for the reason that it advances impractical ideas; and many of the fights against trusts result in no good for the reason that practical ideas are not used in the fight.

(Signed) Aunt Mary."

Well, it's little use speculating. The Independent manager ought to be able to show the farmer who his neighbors are, and whose telephones are the best, whether the old lady is Aunt Mary Monopoly, or just a plain, partially-informed, good intentioned young man who fills space for the papers.

Line Testing in the Small Exchange.

There was a time when, in the average small exchange, line trouble was located by conversation. Manager and lineman got together and discussed the probabilities, and then arranged to get to the assumed location of the fault in the easiest way. But geography and a delicate appreciation of the amount of force required to turn a magneto are poor equipment for measuring the elctrical properties of telephone wires.

Nowadays even the owner of a little line carrying twenty instruments wants to be able to make tests. He knows that he can buy for a reasonable price an instrument which will do all the work given it, and that to learn how to use it is easy. By testing for trouble he can tell almost exactly what and where the fault is. This means a saving of time and travel. It is easier, and less expensive, to find trouble that has been located by a test than to run it down by the old fashioned process of "chasing trouble."

Education for Telephone Engineering

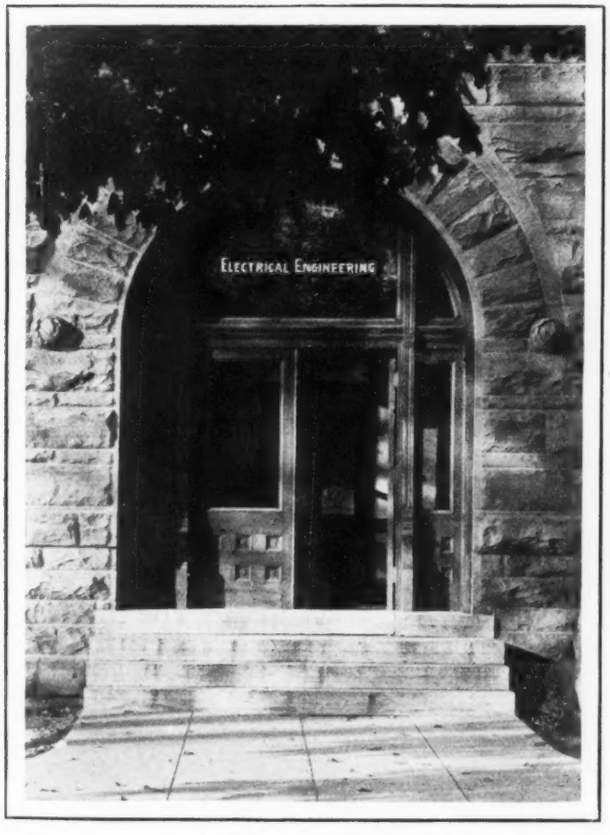
By Arthur Bessey Smith

Assistant Professor in Telephone Engineering, Purdue University.

"What shall I do? Shall I take a course in electrical engineering in some school? Or shall I enter at once the commercial field with a telephone company or manufacturer and work up in a practical way?" Many a young man is asking himself these questions, and upon his decision may depend a large degree of his success and happiness. Success is not to be measured chiefly in dollars and cents, yet we need a certain competence which is brought by a fair money return for our labor. But beyond that, the real satisfaction and happiness of life come in doing the work for which we are adapted, in enjoying our daily occupation.

But even if we are engaged in the work which we like best, we miss something if we cannot measure up to the best of which we are capable. Suppose a man starts in at the bottom with no technical preparation. Though for a time he makes as good progress as any, soon he finds increasing difficulty in fulfilling new and stringent requirements. Finally he comes to a standstill and sees other men step up into places which he would gladly fill. He has risen as high as he was prepared to go.

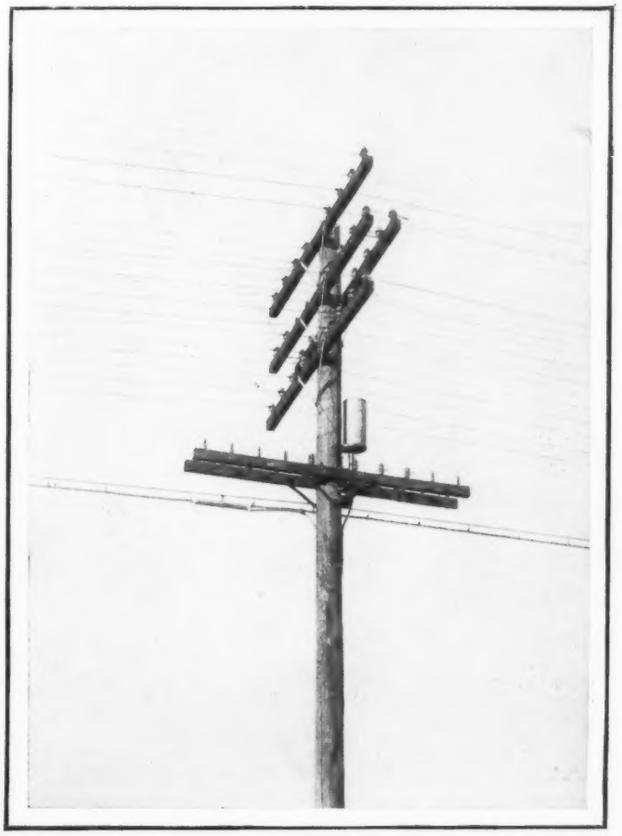
Engineering has been practiced in one form or another



Entrance to the Electrical Engineering Building of Purdue University.

ever since the world began, and as the result of these centuries of effort and experiment many valuable facts have been discovered. In the recent past, the number of discoveries has been extraordinary large. Now, what shall we do? Shall the young man neglect all the accumulated experience and attempt to rediscover it all for himself? This would be the so-called "practical way," or "beginning at the bottom and working up."

No, the loss of time and waste of materials involved in this method is self-evident. He would be foolish not



Example Pole on Purdue University Campus Carrying Lighting and Telephone Wires.

to acquire all the results of past experience, and, starting on them, build up for the future. This is what is done by a technical school. The results of centuries of practical experience are at the call of the student, to guide him away from the mistakes which others made.

It is none the less true that the technical graduate must, after leaving school, enter the hard school of experience where he learns at first hand how to use the tools and methods which have been bequeathed him by the past. Nowhere else can he learn it. But he will be quicker to learn, and rise faster because he knows the reasons underlying the methods.

STATUS OF TELEPHONE ENGINEERING.

The older schools had little or no place for engineering training. Many of the present technical schools give scant attention to the telephone. At best, a course of two recitations per week (no laboratory work) for half a year is expected to cover the telephone, telegraph, and all means of electrical communication. Under these conditions it is no cause of wonder that many enthusiastic telephone men prefer to go directly into commercial work, instead of taking a four-year course in electrical engineering, of which

so small a portion is devoted to their specialty. A further reason lay in the ill-concealed contempt which nearly all electrical engineers once felt for the telephone and its work. They assumed that because of the size of the telephone instrument its use was simple, and unworthy of the attention of a real engineer.

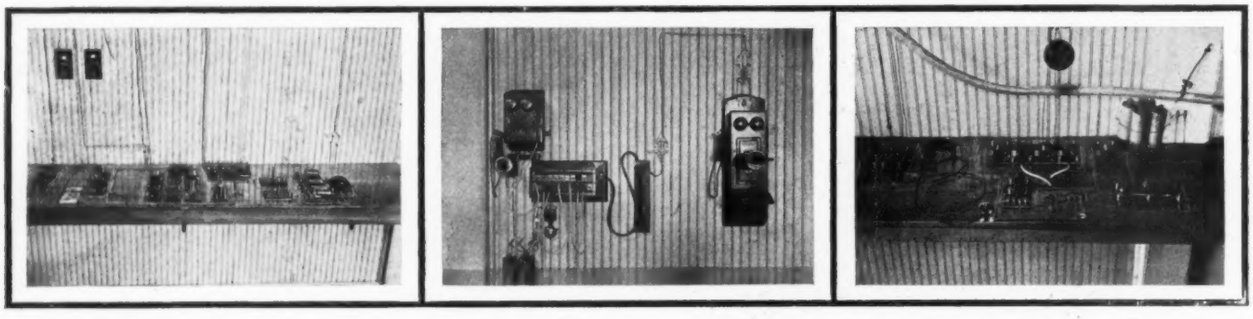
But the developments of recent years have shown that there is in the science of the telephone a world of unexpected treasures, and in its engineering an array of problems which tax the ability of the most skillful men. Today there are a number of exceedingly able men who devote their time to telephone engineering and find in it ample scope for the full employment of all their powers, with generous financial returns. Around them are gathered an army of engineers as assistants, whose work is interesting and varied, with salaries commensurate with their abilities.

The telephone manufacturing company of years ago put apparatus together by guess, or in imitation of goods made by others. Now the most reliable firms have established engineering departments in which a thorough and scientific search is made for the best methods, materials, and forms of construction.

In all these classes of work the college-trained man is increasingly in evidence. The better positions are practically all filled by men of technical training, so that for the future the young man who hopes to rise without it must do so by sheer force of overwhelming ability. Even then it is very possible that he might have done better if he had the training.

A TELEPHONE SCHOOL.

Six years ago the telephone department at Purdue University was established. The object is to give young men



Apparatus in Telephone Laboratory. The various Circuits Are Laid Out with All the Apparatus Connected so That Wiring May Be Easily Traced.

that special training which will bring out their latent abilities along telephone lines. Not every man can become a general superintendent, a sales manager, or a consulting engineer, for his natural endowment may not be suited to those callings. But there are plenty of profitable positions all the way down the line which the average young man can fill with credit, if he has the training. In any case the school is not a mill, but an opportunity for self-development.

The class room and laboratory at Purdue University offer to the young man a revelation of himself to himself —of the things which he is capable of doing. Beginning with the simplest and most obvious facts and the laboratory experiments most suited to each student, the work advances by easy stages to the end of the course. The discussions in the class room are paralleled by laboratory exercises with commercial apparatus from well-known manufacturers. While the student is demonstrating laws and principles, he is getting acquainted with the forms of telephone parts which he will meet in commercial work.

COURSE OF STUDY.

The studies in the telephone department are based upon the regular electrical engineering course; certain non-electrical studies in the third and fourth years being omitted, and those having a special application to telephone work being substituted.

In the first year general training is given in English, German, mathematics, drawing, and shop work.

In the second year the student takes up descriptive geometry, history, mathematics and physics, and continues with languages and shop work.

The third year marks what is practically his introduction to the special studies of electrical engineering and telephony. The special telephone work comprises studies in the principles of telephone apparatus, with special attention to local battery systems. Laboratory exercises are intended to bring out the laws of telephone circuits.

In the second semester the studies of physics and electrical measurements of the regular engineering course, is supplemented with a special course on acoustics and the theory of wave motion. And instruction is given in practical telephony, including common battery telephone apparatus, switchboards, party lines, etc., and an introduction to the automatic system. The principles are not only covered by lectures and recitations, but are made familiar to the student by laboratory exercises.

The senior year is almost entirely given up to specialized study in electrical engineering, covering a broad range of practice, with special work applicable to telephony, set forth in the program as follows:

"Telephone Engineering 1. Advanced and detailed work on telephone apparatus. Theory of the automatic system, central office location, wire plant design, aerial and underground construction, and other engineering work.

"Telephone Laboratory 3. Testing of telephone apparatus, design of construction and circuits. The automatic switchboard."

The second semester continues the general electrical studies, and the telephone work is specified as:

"Telephone Engineering 2. Storage battery, power plant design, traffic, financial problems, costs of materials and work, specifications, etc.

"Telephone Laboratory 4. Advanced studies in telephone problems, special research, etc.

"Thesis. Some special subject which the student studies, on which he experiments and draws conclusions, to give practice in independent thought and work."

The question is often raised, "Why devote so much time to studies other than the telephone and the allied electrical subjects? Why not spend one year full on electrical and telephone work alone?" This would save time and money and useless expenditure of mental energy."

Let us think a moment. The method of procedure is determined by the object which we have in view. If you want a box made, you would go either to a carpenter or a cabinet maker. If it is to be a rough box, a carpenter can knock it together in an hour or so. If it is to be a

(*Concluded on page 644.*)

Economical Development of Toll Territory*

By Frank F. Fowle

Consulting Electrical Engineer.

There is some variation in the practices of toll line companies as regards a reduction in the rates between certain hours of the day, usually from 6 p. m. to 6 a. m., when the traffic would otherwise be small. Some companies have never given a reduced night rate; others have given a half-rate, and some of these have abolished it recently. Night half rates were originally given, it is believed, to stimulate traffic and educate the people to the use of toll service. This purpose was undoubtedly accomplished, but there was developed at the same time a considerable volume of night traffic which could not bear the full day rate. That is, the service at night half rates came within the means of and became useful to a large number of persons who could not afford the full day rates, or only a very limited use at those rates; this class naturally resented the abolition of the night half rates. A toll rate graded according to the demands upon the toll lines at various hours of the day has to recommend it the same reasons that make it good policy to grade the rates for local exchange service according to whether a telephone is located in a place of business or a residence; according to whether it is connected to a single or a party line, and also, under measured service, according to the number of local messages. In other words it is good policy toward the public to present a rate schedule which will develop the greatest number of patrons, distributing the burden of expense among them in proportion to the amount and the grade of service rendered to each patron; in no other way can a maximum development be reached or the public be served so completely.

There is one very essential point in connection with reduced night rates, or rate reductions at any time of day, and that is a consideration of the factors in formula (1) which may properly be reduced; the minute-mile rate, m, is the only factor which should be given different values during various hours of the day, although it may be remarked that any plan which increases the total number of connections should decrease the average values of the factors P, L and G, and possibly C. Proceeding on the theory that a reduced night rate places the service within the means of another class of patrons and consequently increases the night traffic, it is also reasonable to expect that some of the former patrons will, for reasons of economy, transfer their calls to the night period; it is reasonable, therefore, at the time of instituting a reduced night rate to raise the day rate slightly. Conversely, the discontinuance of a night rate schedule should be accompanied by a slight reduction of the day rate, unless the change is intended to increase the gross revenue and decrease expenses.

A graduated rate, as will be shown later, is the one means which the telephone company possesses to regulate the public demand for connections; the graduated rate principle may be used to cut down the peak of the traffic load and build up the load at times when it would otherwise be small,—that is, to secure a higher load factor. Periods of large and sudden demand cause slow and uneven service; any means for avoiding them produces better service, because the average delay is less, and the delays are more uniform. In some instances the large number of appointment calls received for connection at the commencement of the low rate period of the day has resulted in traffic congestion and poor service.

*Paper presented at the Convention of the International Independent Telephone Association. Continued from issue of December 12.

There are several remedies, one of which is to cancel the night rates, but this is unnecessary, because the difficulty may be avoided by substituting a period of a few hours in which an intermediate rate schedule is in effect, so as to avoid sudden rate changes of considerable amount; the difficulty may be avoided also by refusing to receive appointment calls, but it would be a more logical plan to make an extra charge for appointment calls, on account of the extra load placed upon the operators, and thereby reduce the number of such calls, they having been given free of extra charge in the first instance.

An illustration has been prepared of the use of the rate formula, making certain approximate assumptions as follows:

m = \$ .0016 day rate.
m = .0008 night rate.
T = 3. minutes.
P = \$0.05.
L = .10.
G = .03.
C = 10 per cent, but not over \$ .10 nor under \$ .05.

Values of l have been taken between 50 and 500 miles, and the resulting values of R have been plotted in Fig. 1. This is based on the loads which might be expected in handling particular party business; for distances less than 50 miles the two-number basis would be employed wherever possible and the operator loads and circuit loads would be higher, so that different values should be used in the formula.

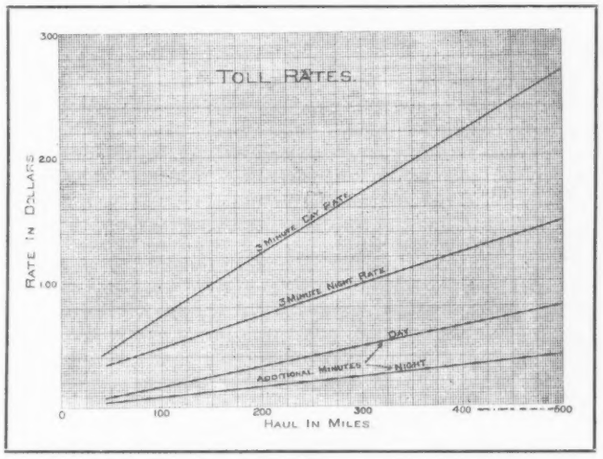


Fig. 1. Curves of Toll Rates Obtained from the Rate Formula.

When toll traffic is handled over circuits whose ownership is divided between two or more companies, the revenue should be pro rated between the companies. There are various methods of doing this, but in order that both companies may be done equal justice, the method which is used should divide the revenue in proportion to the expenses and plant charges of each company.

Under this method of settling accounts between two companies, the following procedure would be duplicated with the business between each pair of zones or toll centers: compute the average revenue per message and the average length of conversation, from the total business for the month, and then divide the average revenue per message into two parts, as shown in the formulae (2), (3) and (4), presented on the following pages:

Let R = average total revenue per message.

Let R' = the proportion of average total revenue going to company A.

Let R'' = the proportion of average total revenue going to company B.

Let l' = the line mileage owned by company A.

Let l'' = the line mileage owned by company B.

Let $T+t$ = the average length of conversation.

Let P', L', G' and C' = the terminal charges incurred by company A.

Let P'', L'', G'' and C'' = the terminal charges incurred by company B.

The relations are then expressed by:

$$R' = m l' (T + t) + P' + L' + G' + C' \quad (2)$$

$$R'' = m l'' (T+t) + P'' + L'' + G'' + C'' \quad (3)$$

$$R = R' + R'' \quad (4)$$

The traffic is usually the same in each direction over the circuits, in a period of a month, but if there is any material difference, separate settlements may be made upon the traffic originating at each end of the line. After the terminal charges are once settled upon, they may be lumped into a single sum for ease in computation. Should the number of lost calls not be substantially the same on traffic originating at either end of the line, a special allowance may be agreed upon, comprised of a small amount to cover the cost of handling such calls, this allowance to be applied only to the excess of lost business in one direction over the lost business in the other, there being no allowance to either company when they lose an equal number of originating calls. If l' is greater than l'', company A loses more revenue than company B when the line is out of service for any reason; it is therefore to company A's interest to have company B clear all circuit trouble in B's territory very promptly. This may be accomplished by an agreement that when B fails to clear the line within a stated maximum period, company A may send a lineman after the trouble at B's expense; of course this plan should operate both ways. Another plan may be worked out on the basis of penalizing the company which has failed to clear any troubles after a stated maximum interval, the company so penalized to recoup the other company for part of its losses.

LEASED WIRE AND PRIVATE LINE RATE SYSTEMS.

The leasing of private lines for telephone or telegraph service, or both, forms an important source of revenue to toll companies. Leased wires are used extensively by stock and grain brokers, packing companies, press associations and large industrial concerns. There is a good demand for such facilities at all times and there is some demand for private telephone circuits. The use of systems for simultaneous telephony and telegraphy makes possible a high degree of economy where the same line wires that are in use for commercial message traffic are also in use as leased telegraph circuits, earning revenue from two sources simultaneously. It is not usually possible to make such double use of all wires on one route, but fully 50 per cent of them can be so used.

The standard prevailing rate for leased telegraph circuits is $20 per wire-mile per annum, plus a charge for each intermediate station that may be connected to the circuit.

The prevailing rate for leased telephone circuits is $40 per circuit-mile per annum, plus a charge for each intermediate drop. In each case the leased wire subscriber furnishes his own operators; the telephone or telegraph company has on duty wire chiefs who look after all circuit trouble as it appears and, in the case of telegraph leases, telegraph operators are on duty at repeater stations to keep the repeaters in adjustment; wire chiefs are usually charged with the duty of supervising all leases. The $20 rate per wire-mile per annum is slightly in excess of the average gross revenue per wire-mile per annum which large toll companies are able to earn, which ranges between $15 and $20. The hours of service usually comprise a total of 10 hours, from 7 a. m. or 8 a. m. to 5 p. m. or 6 p. m. Rates for shorter hours are usually graded according to the general public demand for telephone service, in recognition of the principle that the relation between supply and demand fixes the price; the supply is constant and the rate is, therefore, graded in accordance with the changes in demand through the hours of the day. There is, however, very little demand for leased telephone circuits for short periods of one, two or three hours, at any time of day.

A very attractive form of service which toll companies are in a position to offer exclusively, is a schedule under which a leased wire subscriber may use the telegraph or the telephone as he chooses, except that he may not use both at the same time. That is, for a certain contract price, the subscriber is permitted a certain number of hours of telegraph service or a certain number of hours of telephone service, or the alternate use of both in any manner such that the sum of the pro rata charges for each kind of service, regardless of how the subscriber alternates, does not exceed the contract price; excess service should be billed at the full message rates. An essential feature in any such rate schedule is the avoidance of discrimination, so that however the leased wire subscriber may choose to avail himself of service under his contract, the lowest equivalent price for telephone or telegraph service is consistent with the other rate schedules for public telephone message service, and for exclusive telephone or exclusive telegraph leased wire service.

In working out such a rate schedule it will be found practically necessary to confine the subscriber to telegraph service during the hours of maximum public demand for telephone connections, or otherwise, he may desire to change from telegraph to telephone service during the peak traffic load and thus congest the traffic unless spare facilities are waiting for him; spare facilities during the peak load cannot be provided on a profitable basis except at the rate for a 10-hour telephone lease. The possible rate combinations under the plan just described are too numerous to be described here at length, and it has been attempted to touch only upon the principal features of such schedules and to indicate how they may be constructed to secure additional business without providing additional line facilities.

Theoretically the rate for a leased circuit is arrived at as follows: Let R=the total annual rate for a lease between any hours and over any distance. M=the annual rate per mile, between the contract hours. l=the length of haul. P= the terminal plant charges per annum, comprised of interest, depreciation, maintenance, taxes and insurance upon the leased wire equipment and the loops to the subscriber's office and any rentals for the same when leased from another company. n= the number of terminal and intermediate subscriber's office. L=the labor expense per annum for the daily setting up, adjustment, taking down and supervision of a lease, at terminals, intermediate stations and repeater stations. n'=the number of terminal, intermediate and repeater stations where attendance is required.

Then the rate per annum is

$$R = lM + nP + n'L \quad (5)$$

The value of M can be tabulated for all possible intervals between any two hours of the day; M is determined by the annual interest, depreciation, maintenance and taxes upon the lines owned and rentals for lines leased from other companies.

One further point may be brought out, in reference again to the furnishing of operators for handling messages over leased circuits; the operators should be furnished by the subscriber in every instance, although it would be proper for the telephone company to furnish the operators and bill the subscriber for their wages at cost. The telephone company can-

not handle the leased wire subscriber's calls over the leased line, at no further cost to the subscriber, without discriminating against the patrons who pay the regular message rate. On the basis of $.002 per minute-mile for message business, a use of 10 hours per day for 300 days per year amounts to a charge of $360.00 per mile per annum, compared with $40.00 for a leased telephone circuit; the price on the latter amounts to a discount of 88.9 per cent from the message rate, in case the telephone company handles the connections or messages over the leased circuit, and most emphatically constitutes discrimination. When the leased wire subscriber handles his own messages, the two classes of service are dissimilar and the subscriber is burdened with his own operating expense. The operators should be situated upon the subscriber's premises, rather than the premises of the telephone company; in the latter instance the subscriber would be chargeable with rent for floor space occupied by his operators on the telephone company's premises and with light, heat, and janitor service, and his business would not be insured of privacy. In all respects the subscriber's operators will be best situated upon his own premises, under his control.

Many of the fundamental factors in rate-making are independent of any considerations of the telephone business, but in some respects the preceding consideration of rate-making has necessarily anticipated what is to follow. The consideration of rate systems and principles naturally comes first in the order of topics, because all that follows is based upon it. The next topic is that of traffic and the methods of determining in advance how much traffic may be expected between any two toll points or zone centres.

THE PREDETERMINATION OF TRAFFIC.

The traffic in transportation of passengers or intelligence depends primarily upon the density of population and secondarily upon the rates. It is a proven fact that the traffic becomes greater as the density of population increases and as rates diminish, and vice versa. It is important to arrange these facts in the form of a law which may be given mathematical expression, if possible, so that there may be little risk in developing new territory and extending the service.

The specific problem in hand is this: Given the population and the number of telephones in each of two zones, the distance between the zone centers and the rates to be charged for toll service, what will be the volume of traffic? It should be understood at the outset that whatever formula may be developed must be based upon a study of actual traffic in an existing plant and that it will necessarily represent an average so far as individual local conditions are concerned. The actual traffic which is realized after a plant is built may differ considerably in individual instances from the predetermined traffic, but this should not be true of the total traffic in a territory of considerable size. No formula can be developed that will take into account all local conditions, but the average of local conditions in any territory of reasonable size will be taken into account in any formula which is deduced from traffic conditions and results in a similar territory which has been developed; an engineer cannot forcast the results in any new territory more accurately except insofar as his intimate knowledge of local conditions and experience in such matters form a special guide.

There are three fundamental laws which express the effect of the length of haul, the population density and the rates upon the volume of traffic; these are:

I. Between two zones or exchange districts whose population and telephone development remain constant, with a fixed schedule of toll rates based on the length of haul, the traffic will diminish as the distance between the zone centers increases.

II. Between two zones which are separated by a fixed distance, with a fixed schedule of toll rates, the traffic will increase as the population or the development increases, or as both increase.

III. Between two zones which are separated by a fixed distance, with a constant population and development, the traffic will increase as rates diminish and vice versa.

A study has been made of the traffic between different cities and towns, taking into account their population and the distances between them, under a fixed rate schedule. It has not been possible to make an extended study of different systems in which the rate schedules were all different from each other; but notwithstanding, it has been possible to secure a few observations upon the effect of rate changes. After considerable study it was found that the traffic volume in total messages per month in both directions between any pair of zones could be fairly represented by the formula:

$$T = K\frac{P_1 P_2}{D^2} \qquad (6)$$

where T=the total messages per month, in both directions.
P_1=population of either zone.
P_2=population of the other zone.
D=distance between the zone centers, in miles.
K=a constant.

The determination of K was made from the average of eight months' traffic between 34 pairs of zones and the individual values of K as calculated are given below, in order to show with what accuracy the formula may be applied.

Calculated Values of K, Multiplied by 10,000.	Deviation of Average Value from Individual Values.	Calculated Values of K, Multiplied by 10,000.	Deviation of Average Value from Individual Values.
2.03	—.18	2.64	+.43
2.64	+.84	2.82	+.61
1.37	—.84	1.74	—.47
1.93	—.28	2.34	+.13
2.88	+.67	1.86	—.35
2.81	+.60	2.06	—.15
2.33	+.12	1.86	—.35
2.98	+.77	1.53	—.68
2.14	—.07	1.52	—.69
2.25	+.04	1.72	—.49
1.48	—.73	2.04	—.17
1.89	—.32	2.22	+.01
2.64	+.43	1.45	—.76
2.70	+.49	1.98	—.23
1.64	—.57	2.77	+.56
2.52	+.31	Total:	
3.05	+.84	75.07	14.69
2.16	—.05	Average:	
3.08	+.87	2.21	±.43

The formula may be written, when 2.2×10^{-4} is substituted for K, as follows:

$$T = .00022\frac{P_1 P_2}{D^2} \qquad (7)$$

and may be regarded as possessing sufficient accuracy for a development study. The range of distances and population in the instances upon which the calculations for K were based, was very large; no account was taken of the telephone development in the zones used for calculation, but it varied from something like one per cent up to eleven or twelve per cent, with an average of six to seven per cent. It should be noted that the average deviation of the individual values of K from the average value of K is ±.43 or 19.5 per cent of K, which may be understood as meaning that when the formula is applied to individual cases the calculated result will, on the average, be about 20 per cent higher or lower than the traffic which will actually be realized; the total traffic in a large territory, obtained by the application of the formula between all toll zones within it, will be, on the average, within 3½ per cent of the traffic actually realized.

It is very important to note that special conditions will give results that may be much larger or smaller than those which the formula indicates; in deriving the formula, all special conditions were avoided, so far as known. It is assumed first that the territory is continuous mainland as distinguished from islands and peninsulas, and that there are no great natural

barriers of any sort. The traffic to summer resorts may be three or four times as great as that given by the formula, because of the large temporary population; the traffic to state capitols during sessions of the legislature may be several times larger than that given by the formula; there may be special conditions at seaports or lakeports which create additional traffic; a small town which is dominated by one or two large industries may create a special traffic condition; the traffic to and from a particular zone may be restricted because of poor transmission and badly delayed service; and so on,—the various toll zones must be carefully scrutinized to discover all local conditions which in any sense are special or unusual.

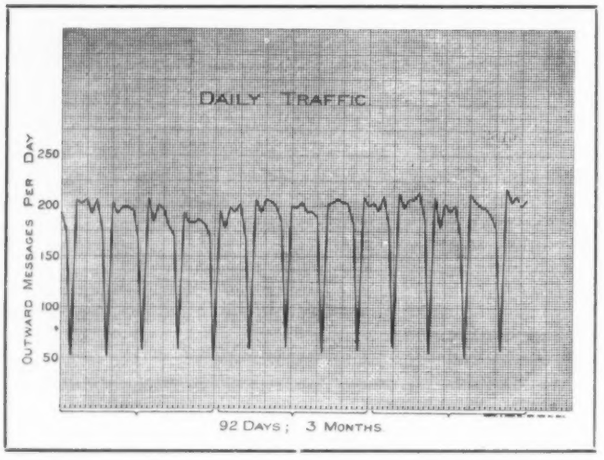


Fig. 2. Typical Daily Local Traffic Curve of a Moderate Size Office.

At this point, the author wishes to say that formulae (6) and (7) are here given for the first time and it is believed that this is the first time that any relation has been stated between the volume of toll traffic, the distance between the zones connected and their respective populations. Further investigation should result in some refinement of the formula and the value of K to use under special conditions and with other rate schedules; the rates here in force were approximately $.002 per minute-mile day rate and a night half-rate, based on railroad mileages. The mileages used in the computation of K were the pole-line mileages, which bear an average ratio to the air line mileage of 1.34. In terms of air-line mileage the formula becomes

$$I = .000123 \frac{P_1 P_2}{D^2} \qquad (8)$$

A highly precise determination of the traffic volume would be of no greater value than one whose precision is not better than ± 5 per cent, for the reason that there are daily, weekly and monthly variations in the traffic which exceed this amount. The traffic varies from day to day, Monday usually being the heaviest of the five days from Monday to Friday inclusive; the load curves of calls received per hour or half-hour during each day of these days are similar. The peak load of the week usually comes on Saturday morning, but the afternoon load of that day is considerably below the corresponding loads of the five preceding days; the Sunday load is usually very small in the morning and moderate in the afternoon and evening. Examples of these load curves are given later. The traffic on corresponding days of succeeding weeks is not constant, but varies up and down in an indeterminate manner, so that there are fluctuations from week to week. There are likewise fluctuations from month to month, even though the year's average shows a growth over the previous year.

Fig. 2 shows a typical curve of daily total traffic in an office of moderate size; attention is called to the fact that while telephones, a value between the lower limit and the average will be the safest one to use, and of the toll companies now operating probably more than 60% receive less than $0.50 per head per annum. These figures are derived from territories where the average rate is probably a little below $.002 per minute-mile, but not substantially different; where the total traffic on a Saturday is below the other week days, the hourly or half-hourly load reaches the weekly maximum. The traffic in one direction between two zones is usually greater or less than the traffic in the opposite direction, being more often unequal than equal; this point is one which it is well to keep in mind when considering double-track operating systems. If the traffic increased steadily month by month through the year, the traffic during any month would exceed that of the previous month by one twelfth of the total annual growth; a comparison of actual monthly traffic with the traffic as it would have been under the assumption of steady growth will show the characteristic monthly variations. Such a comparison has been made and the results are tabulated below, being the averages computed from the monthly traffic in and out of a given office for five years. The results are expressed in per cent, a plus sign indicating a result higher than normal and a minus sign indicating a result lower than normal.

Month.	Deviation of Traffic From Normal.
January	+1.23%
Feburary	−6.45%
March	+6.79%
April	+3.11%
May	+2.39%
June	−0.87%
July	−4.57%
August	−2.92%
September	−4.38%
October	+3.99%
November	−0.43%
December	+4.29%

February is a 28-day month with one holiday, which accounts for the depression; November is a 30-day month, also with one holiday. Aside from these deviations, the figures show a general depression of business during the summer months and an excess during the winter months. It is obvious that comparisons of the traffic in any given month with the traffic in the month preceding are misleading unless interpreted with due allowance for these variations.

After the formula has been used to compute the probable amount of traffic between all the toll centers in a given territory, the following plan may be employed for checking the results. Compute the total probable revenue, from the traffic figures and the rates, on the basis of an average length of conversation of 4½ minutes, on the traffic between each pair of zones or toll centers; next compute the

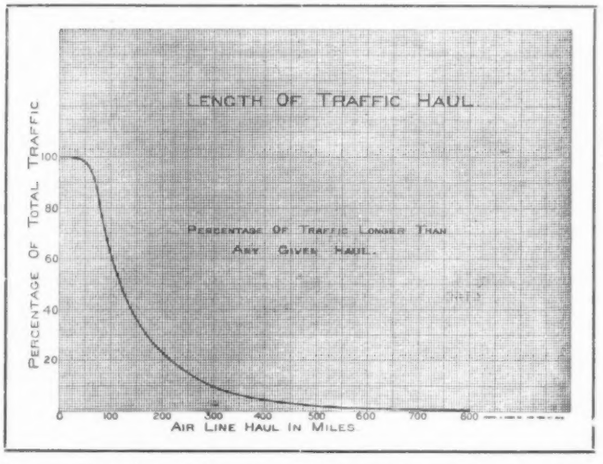


Fig. 3. Relation Between the Total Traffic and the Length of Haul.

total revenue on the traffic in and out of each toll center and take half of that amount as the revenue on the originating traffic; from the latter amount compute the annual toll revenue per head of population within the zone or district. An average value for the total annual toll receipts per head of population is $0.50, but this figure varies, however, between the approximate limits of $0.25 and $1.00; in territory having poor development as regards exchange there is no reduced rate at night the total annual receipts per head of population are probably 10% to 15% higher than the figures above given.

At the same time that the total receipts are computed for each toll office, the total traffic may be computed also. The traffic figures, when arranged according to the length of haul, will show very forcibly how the volume of traffic decreases with increasing hauls; the length of haul is one of the considerations which affect the choice of the best operating method to handle toll traffic. Fig. 3 was prepared from the outward traffic of a toll office, arranged in the order of hauls, on air-line mileage; the curve shows what division of the total outward messages is longer than any particular haul all business of less than 40 miles haul being excluded. This type of curve will be of use in laying out a toll circuit scheme to handle the traffic, as regards a proper proportion of the total circuit mileage between long haul, reasonable to expect that the percentage of development intermediate haul and short haul circuits. This type of curve will necessarily vary for different offices, according to the distribution of cities and towns around it; but for a territory as a whole, which is evenly populated with towns and cities and is continuously settled and developed, the curve will not differ materially from similarly prepared curves for like territories.

(To be continued.)

The Department Store and the Telephone.*

The large city department store is simply the outcome of the economic rule that wholesale purchases make possible wholesale rates. If the idea is followed one more step it may be seen that competition among these stores will tend to induce them to give customers the benefit of those rates.

When compared with smaller ones, however, the department store has one drawback which a certain class of customers considers to be serious, viz: The inconvenience of crowds at counters where seasonable goods are offered and the repeated delays while sales are being inspected, goods are being wrapped and change is being made. By some, this difficulty is eliminated by using the transfer purchasing slip and paying at a single desk when all goods have been selected. By others, the order—if for staples or other goods, of which a sample can be given—is carefully written out and left at the order desk with instructions to either charge the amount or collect on delivery.

There are many customers who, in purchasing goods, depend entirely upon the advice of the salespeople or other friends. Frequently they think it necessary to consult relatives and to make a second trip to each large store before they finally make the selection. The loss of time and the amount of energy expended is not slight, but, as they say—"It is worth the trouble to be satisfied that the best for the money may be obtained."

Prior to June 1, 1905, there was but one large store in the country where the telephone had been used very extensively to eliminate this difficulty. In a large western city the idea had been carried out to equip each department of the store with a telephone and to connect them all by a common switchboard located within the store building. It was thought that the added convenience of allowing the absent customer to talk directly with the department concerned would greatly facilitate sales and the work of adjusting differences. After the service was installed many new uses developed and the telephone became a permanent fixture in each department.

In the spring of 1905 the management of an eastern store was persuaded to take up the telephone idea and to put telephones not only in every department but on every counter. The managers appreciated, at once, that the telephone, by making it easier for customers to purchase, would reduce the cost of sales. Realizing also the steady increase in telephone orders when they had but a meager equipment they advertised that they were installing the system "for the expeditious handling of telephone business during business hours." On the longer counters several telephones were conveniently placed so that no customer or clerk need take more than a few steps to use the telephone. The suggestive feature of seeing others use the service required an abundance of telephone to serve all who would wish to talk.

Hardly had the work of wiring the building begun when other large stores, anticipating the success of the plan, ordered similar equipments. The attitude of the telephone company was unique. They said, "We are putting in each store a plant costing us thousands of dollars. If we thought that the plan would fail do you think that we would needlessly make this permanent investment simply for the comparatively small amount of money that might be received from a temporary trial of the plan? We are taking the risk and we know it will prove a wise investment on both your part and ours."

Telephones were placed also in the order, inquiry, complaint, delivery, lost and found, executive and exchange departments, and in the waiting rooms, restaurant, aisles (in booths), and in every nook and corner of the store. When the installers had completed their work there were over 800 telephones from which any customer might talk without charge to any other department or at regular exchange rates to any other location in the city or out. This installation exceeds that in many fair sized towns.

The plan as thus developed was such an improvement upon the western store's idea that this store received and deserved the name of "The Telephone Store." An advertising campaign was begun in the store's regular newspaper and other media to educate the public to purchase by telephone. Whole double-page spaces dotted with drawings of diminutive telephones and telephone lines urged the people to use the means provided for easy buying.

On the reverse side of every sales check they advertised, "Shop by telephone on rainy days. Shop from the waiting room or restaurant to any part of the store without moving. No charge for this service."

The result was that several of the department stores were nearly swamped with telephone orders. The fact that it was necessary for them to keep ahead of the customers by increasing their telephone equipment from time to time as demands increased showed that they were not disappointed in hoping for a large increase of business. "Not six months in service (one store advertised) and yet we have doubled our trunk lines and the number of annual messages which we thought would be adequate when the service was installed." This was the same store that first took up the idea in the east and that placed an initial order of 800 telephones.

Starting with 40,000 messages, one prominent department store in April increased its contract by 60,000, and in June by 200,000 more, and finally in September contracted for 400,000 annual messages. These changes were all made within a single year. Two other stores are using about the same number of local messages annually, and one is using from 50,000 to 100,000 more. Those made from one tele-

*Abstract from article in the Philadelphia Telephone News.

phone to another within the same store, are, of course, not counted in the above number.

Since a large number of these messages cause others to be sent in return, it may be seen that the incoming telephone business of the stores is very heavy. It has been estimated that over 60 per cent of the incoming messages are orders for goods. These orders are now going to the stores which are fully equipped for handling such business. The fact that the store managers appreciate this is shown by the number of carefully developed ideas for encouraging telephone shopping.

Among the special features developed later were inviting the public to call up the watch department and set their watches by telephone, distributing election news, transmitting music from a nearby theater to customers in the store, all of which were done gratuitously by telephone.

As one feature of obtaining Christmas orders, which otherwise might not have been received, a Santa Claus department was opened, and a number of clerks, with matured voices, received requests over the telephone. After getting the names and addresses of the youthful supplicants they forwarded the orders to other clerks, who telephoned them to the children's parents for confirmation or cancellation. In order to increase this business children were invited to call up Santa Claus' house and hear the music and fun over the telephone. This proved to be a popular feature for sick children kept at home and for invalids who wished to get in touch with the outside world. In the store telephones were placed on low stools for visiting children to call up Santa Claus.

Some stores advertised instantaneous delivery of goods urgently needed and ordered by telephone.

In the stores the saving of the employees' time by the free use of exchange service for store business, both within and without the stores, counts materially in the annual departmental saving. All department heads may be reached simultaneously without seriously interrupting their work, and instructed concerning any change of policy or special work. Store detectives, as well as night watchmen, use the service for reporting at regular intervals. Accidents are reported to the proper authorities. The fire risk is greatly lessened at all times. Even delinquent patrons are courteously asked to remit by telephone. In fact there are few large stores in any large city that could afford to do business without telephone service which reaches both store employes and its patrons. New uses develop almost daily and it is expected that the near future will see not only all stores equipped, but adequately equipped, with telephone service.

Local Traffic.*

By A. J. Shands.

The words "Peg Counts" do not have much meaning to the operators, and sometimes not to the chief operators, and it is usually for the reason that they do not understand why they are taken. From the regular peg counts that are taken a chart is made, and while this shows the changes, gain or loss, from some previous count, and is interesting and useful, the greatest value can be had from the sheets that show the counts as taken by hours, or half hours, as they may be, and the numbers of hours and minutes that the operators worked—the detail sheets. From these sheets the office manager can learn the conditions of each position, not as an average but as they are at any hour. From these sheets it is frequently suggested that further counts be made for certain hours, or, on some positions, at irregular hours. The distribution of the work over the board, and the number of operators necessary is shown. The changing of operators' hours to work later one season and earlier another, the extra number of operators necessary at different hours on certain days of the week, are all worked out from regular or special peg counts.

The question of operators' loads, or the average number of calls that an operator should handle, is one which is probably asked oftener than any other question pertaining to operating. This question is often asked for comparison, sometimes for information, and it is really one which every one has to answer for himself. No one can tell another how many calls his operators should handle per hour, unless he is thoroughly familiar with the conditions. He can say about so many, and be very close, but the number of calls which an operator can handle or the average number that operators are loaded to for a busy hour can only be determined by careful loading and observation. Conditions govern this figure entirely. A single office system, straight work, and a short reach would naturally permit the handling of more calls by an operator than one where there is trunking to do, various kinds of service, etc. Further than that the standard average answering service to be maintained must also be considered where determining the average number of calls the operators are to handle during the busy hours. Operators do their best work when they are given just enough to keep them busy, and not so much that they are always rushed.

A great many methods of testing operators are used and they all are good, but some are better than others for the reason that they are more complete, and more information can be gotten and consequently better results. Listening desks, observation desks and all apparatus of this kind are very good and quite necessary even in the smallest offices, but they must be used constantly to be of any great value. The operators' errors and faults are found out by means of this apparatus, and to get results from this information it is best, or at least quicker results can be obtained, by taking them up with the operator at once.

Too much attention cannot be given to the testing of answering service. This in itself does not mean all that there is to good service, but it goes a long way toward making it up. Answering tests cannot be made too often, and to maintain a good answering time it is necessary to keep up the testing daily. It is not necessary that the answering time alone be tested. All the conditions that a subscriber may meet should also be tested, and this can be done in connection with the answering test. In large exchanges the all-night test should be kept up as well as the day or evening test, and in exchanges where this has not been done, or to those who have not had some experience, the tests for the first few nights may be a little surprising.

In a modern common-battery exchange of any size, the average answering time for the day and evening hours should be kept under four seconds, and with regular testing and good supervision this can be done.

*Paper presented at the Convention of the International Independent Telephone Association. Concluded from issue of December 12.

Alaskan Traveler Brings Aid By Cutting Telegraph Line.

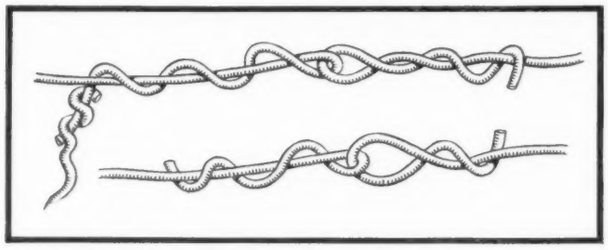
Reports from Alaska tell an interesting story of the method by which a traveler, when nearly exhausted in going over rough ground in Alaska, saved his life. When he found he was unable to go farther, he broke the telegraph line beside which he was walking. The men sent out to repair the trouble found him the next day, without food, partially paralyzed and unable to walk.

The recommendation by the military officer in charge of the telegraph line was that there should be no punishment of this offender, although under ordinary circumstances, the penalty visited upon a man breaking a telegraph line in that country would be severe.

LETTERS ON PRACTICAL SUBJECTS

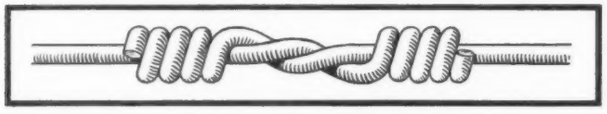
Poor Service Due to Bad Splices in Farmers' Line.

The joints whose form is indicated in the sketch which we send you were found in the line of a rural telephone company in Arkansas. This line, which is eight miles



Sample of Splices on Lines of an Arkansas Rural Company.

long, had been repaired by some farmer living on the route. For a long time subscribers had complained of poor service, and, on looking the line over carefully, we found these connections. The service given to the six telephones



The Correct Form of Splice.

beyond them was, of course, very unsatisfactory. Perhaps some of your readers would profit by having this called to their attention, if at the same time you would show a picture of a correctly made splice.

Augusta, Ark. W. B. Gullie.

Test Connectors for Subscriber's Loop Attachment.

In the issue of TELEPHONY for November 14 I noticed under the heading of Practical Questions and Answers an article on the method of connecting drop wires to lines. In this article, test connectors are mentioned. I have charge of maintenance on 90 miles of toll lines in this vicinity. In this 90 miles, we have installed 19 test stations which are connected with test connectors.

These lines have been in operation for a year and one half, and I have had no trouble whatever from test connectors being loose and causing open lines. The secret of a successful test connector is in the application on the line. Many good test connectors have failed on this account, it not being the fault of the manufacturer, but the lineman's carelessness in putting them on.

Tacoma, Wash. Oscar T. D. Brandt, Manager,
Northwestern Long Distance Telephone Company.

Good Grounds.

The subject of "good grounds" has been not infrequently discussed in TELEPHONY, but there is not enough care given to the subject. Considerable trouble seems to result from a lack of proper grounding. Under ordinary conditions a good ground can be obtained in the following manner: Take a 12 ft. piece of galvanized water pipe one inch in diameter, and drive 11 ft. 11 in. of its length into the ground. Put a plug inside the pipe, and drive it down one inch. Then take a No. 8 copper wire, making a coil small enough to slip into the end of the pipe, and fill the pipe full of solder.

The use of the plug will prevent the loss of the solder, and the one inch solid contact will be a sure and permanent joint between the wire and pipe. The length of pipe is sufficient to go below frost, and reach moist earth. Ground rods for subscribers' stations can be made of 8 ft. pipe ¾ in. in diameter, with a No. 13 copper wire coiled and soldered in as above.

Green River, Utah. G. P. Schlosser.

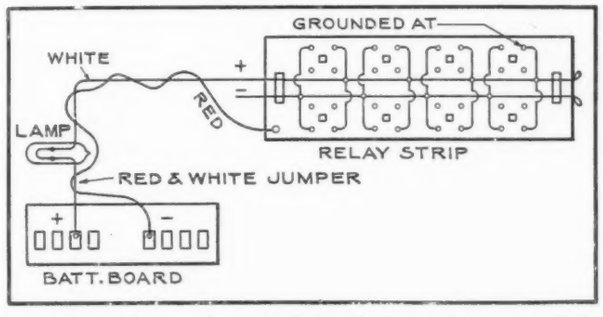
Location of Open Circuit in Relay.

The location of relay trouble in large common battery exchanges often presents perplexing problems which necessitate tedious and painstaking study. Sometimes the cause of trouble cannot be seen, and electrical tests have to be relied on entirely, as in the following case where one of the tip (+) battery leads of the non-inductive winding of a Stromberg-Carlson line relay was grounded on the frame. Trouble was not discernible by the eye, because, as became evident when repairs were finally made, the contact causing the ground on the frame was due to the leading-in wire of the winding having parted, the free end resting on the iron strip, inside, next the coil cap base. It was only apparent that the positive common wire was grounded in one of the relays of the strip, and the problem was to locate the precise relay containing the fault.

Tests with a receiver revealed nothing as to the location of the defective coil since the leads from the tip battery wire to the various coils were all in multiple, that is, off the same bus bar. Hence it was impossible to quickly locate the faulty coil with a receiver. The bay of relays had just been installed and the cables were already soldered in, so that some method had to be adopted which would not injure the cables, nor require too much time in testing out.

The following device was used: A 40-volt switchboard lamp was connected in series with the white strand of a red and white jumper wire pair, leaving the wires free at each end of the jumper. The lower ends of the jumper wire were connected to the battery fuse blocks at the bottom of the bay; red being attached to the negative battery terminal, and white to the positive battery terminal.

The upper ends were connected as shown in the drawing; the red fastened to the iron mounting plate by a machine screw, and the white to the positive battery bus bar feeding that relay strip. Wires running to the battery were unsoldered from the bus bars during the test. The positive battery leads between the bus bar and the various coils were removed, and then immediately returned, one by one. When the lamp went out, it signaled that the wire just removed led to the faulty coil. The coil was then removed from the strip and the broken wire soldered down in place again on the terminal pin.



Connection of Testing Lamp to Relay Wiring and Mounting Plate.

When the coil was tested, after being replaced on the strip, it was found clear.

This test is absolutely accurate, and trouble on relay multiple contacts as above described is quickly found by its use.

Minneapolis, Minn. A. M. Severson.

Telephone Law

Conducted by A. H. McMillan

Damages from Street Railway Electrolysis.

Will you please state through your columns what decisions, if any, have been rendered in favor of telephone companies relative to damages to underground cables from street railway electrolysis?

Under what conditions can collections of such damages be enforced, also what conditions would make such collections difficult?

When a telephone company's wires are grounded upon its own or its subscribers' property, and it suffers injury from electrolysis, it may recover from the traction company such damages as are occasioned thereby. It is not material that the injurious act is done upon the premises of one other than the injured party. Cumberland Telephone & Telegraph Co. vs. Railway Co., 93 Tenn., 492; 4 Am. Elec. Cases, 297, 29 S. W., 104; Hudson River Telephone Co. vs. Watervliet R. Co., 135 N. Y., 394, 642; 32 Northeastern, 149; 31 A. S. R., 838; 4 Am. Elec. Cases, 275, National Telephone Co. vs. Baker, L. R., 2 Ch. Div. 189. Where a telephone company's wires are grounded in the streets, it is not entitled to the same protection, and the collection of damages is difficult. The use of the streets is primarily for purposes of travel, and hence, in the public ways traction companies are entitled to superior rights.

If the telephone company grounds its wires in the streets, it has no remedy for injuries it suffers from electrolysis. Bell Telephone Co. vs. Montreal St. Railway Co., Rap. Jud., Quebec, 6 Cour Du Banc., De La Rein 223; Rocky Mountain Tel. Co. vs. Salt Lake City R. Co., 3 Am. Elec. Cases, 383; Cumberland Telephone & Telegraph Co. vs. United Railway Co., 42 Fed., 273;; 3 Am. Elec. Cases, 408. McMillan on Telephone Law, Secs., 132, 136.

Refusing Service for Failure to Pay Tolls.

I wish to know where I can find decisions concerning refusal to give a subscriber toll service until he pays what he owes for toll service and telephone rental service. I have seen it in some of the telephone journals. Have you a volume or volumes on telephone decisions? If not, where can I buy them?

You are entitled to discontinue the service of a subscriber who is in arrears for rental. State vs. Nebraska Telephone Company, 17 Neb., 126; 52 AM. Rep., 404; State vs. Kinloch Telephone Co., 93 Mo. App., 349; State vs. Citizens Telephone Co., 61 S. C., 83; 39 S. E., 257; 85 A. S. R., 870; 55 L. R. A., 139. Service may also be discontinued for failure to pay tolls. Irvin vs. Rushville Co-operative Tel. Co., 161 Ind., 524; 69 N. E., 258; McMillan on Telephone Law, Secs. 85 and 239.

The Editor's work on Telephone Law may be obtained from the publishers of Telephony.

Collection of Assessments.

On November 2nd, 1907, our company had several stockholders who did not have telephones, and as we built about 10 miles of new line and repaired 8 miles of old, the directors voted to make an assessment on the stock of $8 per share and let the assessment apply on the rental of those stockholders having telephones. At this date we have three who refuse to pay the assessment. Please tell me what course to take in order to collect it.

The proper course to take to collect assessments of those who refuse to pay them is to bring suit at law for the amounts due.

Suit for Stock Subscriptions in Telephone Company.

The declaration in the suit instituted by Charles M. Myers and Edward M. Colie, as receivers of the Telephone, Telegraph and Cable Company of America against John Jacob Astor, has been filed in the Supreme Court of New York. Annexed to the declaration is a notice to Mr. Astor that judgment will be sought for only $110,000, with interest from December 31, 1900, and costs of the litigation.

According to the declaration, Mr. Astor on November 29, 1899, entered into a subscription agreement for the purchase of 22,000 shares of the stock of the company, then having a par value of $50 a share. It is asserted that the subscription for 10,000 shares was made by Mr. Astor personally; 10,000 shares by Stephen Wood, and 2,000 shares by George F. Hawkins. The directors described both Mr. Wood and Mr. Hawkins as "dummies" acting as agents for Mr. Astor.

Mr. Astor from time to time paid assessments on the stock amounting to $10 a share, but failed to pay an assessment of $5 levied by the directors which became due on December 31, 1900. It is to recover the $5 on each of the 22,000 shares that the suit was brought. Subsequent to the levying of the assessment, the authorized capital stock of the telephone company was reduced from $30,000,000 to $9,000,000 by reducing the par value from $50 to $15 a share. The receivers assert that the holders of the 125,000 shares have paid up the entire $15 a share, but that Mr. Astor and his "dummy" agents have not.

Pole Tax Reduced in Pennsylvania.

At Towanda, Pa., Judge Fanning has rendered an opinion in the matter of the petition of the Independent Telephone Company of New Albany for a reduction of the tax levied by the borough of New Albany against the company.

The Independent Telephone Company is a local concern operatng in New Albany. It has 94 poles, two and one-half miles of wire, and 31 telephones. The New Albany borough council, by ordinance regularly passed, levied a tax of 35 cents per pole and $1 per mile on the wire, making a total levy of $35.40 for a year, which the telephone company claimed was unreasonable and unwarranted, and petitioned the court for a reduction.

After taking the case under advisement, the court decided that a tax of 15 cents per pole from October 1, 1907, to October 1, 1908, would be fair and reasonable for the first year, and that 12 cents per pole per year thereafter would create a fund sufficient to pay the expense of inspecting poles and wires. He also decreed that the poles and wires be tested and inspected by the borough, semi-annually, to avoid accidents from falling poles and wires.

Oregon Initiative Act Assailed by Telephone Company.

Alleging that the initiative act, under which $10,450.66 is said to be due the State of Oregon from the Pacific Telephone and Telegraph Company in license fees on its gross receipts, is unconstitutional for five reasons, the company has appealed the case to the supreme court.

It alleges that the law is defective because the tax provided for by it is not uniform and amounts to double taxation. It is further contended that the measure violates the initiative and referendum amendment to the Oregon Constitution, and because the Federal Constitution and the Oregon amendment did not harmonize, the initiative amendment being therefore invalid. Against the initiative amendment, it is further alleged that it is inconsistent with our form of government for the people to make laws directly, the legislature being created for that purpose. It is said that taxation by the initiative method violates fundamental rights, and is not in accordance with the law of the land. The act is also said to violate the congressional act under which Oregon was admitted to the union.

Practical Questions and Answers

Pole Changer on Heavy Farmers' Lines.

We are using a Warner pole-changer on our board, with 60 cells connected, for alternating current ringing. We experience considerable difficulty in ringing out over farm lines which parallel high tension transmission lines. Our farm lines carry from 10 to 15 telephones, equipped with 1,600 ohm ringers. Would it be possible to connect into the alternating current circuit of the pole changer a transformer which would bring the voltage up to 110 volts? If so, what size wire and resistance should be used in both the primary and the secondary circuit of such a transformer. Also, what form of core should be used for it? I find that we can ring out on line with a 5-bar hand generator, which generates about 110 volts. The pole-changer only comes up to about 80 volts.

Adding 10 or 20 more cells to the pole changer, and adjusting the contacts closer, will raise the ringing voltage enough to do the work required.

By putting a transformer across the A. C. side of the pole changer you can raise the voltage according to the ratio of transformation of the transformer, but in so doing you will decrease the power delivered to the line, because of the inefficiency of small transformer. That is to say, if the pole changer delivers 2 watts to the transformer, at 60 volts pressure, the transformer can deliver only 1 watt at 130 or 150 volts pressure to the line. The transformer uses up, or wastes, one-half of your power.

Another method of accomplishing what you want to do, is to use a transformer type pole changer, the cost of which will be but little more than the cost of a special transformer. This type of pole changer consists of a single unit of a regular frequency pole changer as used in harmonic systems.

Current and Voltage in Generator Armature.

It will be noted that the armature of a telephone hand generator passes both poles of the magnet, hence the current in process of generation will be alternating in character, being inductively affected by the change in magnetism in the two poles of the armature. The form of the current wave is determined by the size of the armature pole arms, that is, the metal arms of the armature being shaped as in Fig. 1. It will be noted that, as the armature poles pass the magnets, there is a neutral point where the current changes from positive to negative. At right angles to this is the point of maximum induced current. Is the above correct?

In general the above is correct, though not strictly so. A more strict statement would be as follows:

While the armature poles are passing through the horizontal line, *AA'*, the *voltage* induced in the armature coil is zero. At right angles to this line, that is, while the armature poles are passing through the line *BB'*, the induced voltage is a maximum. Owing to the inductance in the circuit, the current will not have its maximum at the same time as the voltage induced, but will lag behind it in most cases. It might be made to lead the voltage. The above statements are true if the current flowing in the armature is not strong enough to affect the magnetism produced by the steel magnets. If the current is strong enough to have appreciable magnetizing force in the armature it will distort the field, so that the zero and maximum points of even the induced voltage will not be at the points described.

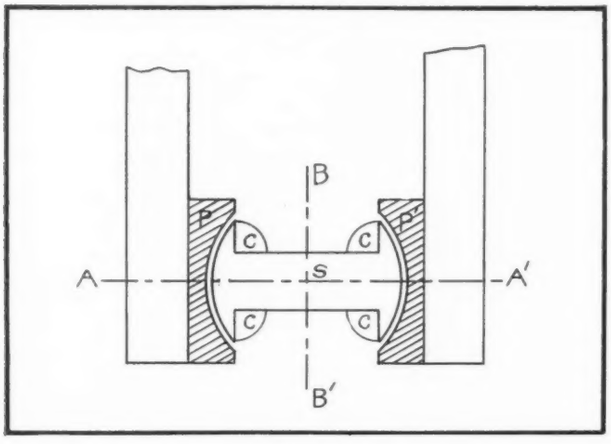


Fig. 1.

TO WIRE CHIEFS AND MAINTENANCE MEN.

Clearing of troubles which occur in your exchange, inside or outside, may be made the subject of short, practical letters which will interest other telephone men These TELEPHONY *will gladly publish, if illustrated by diagrams or photographs. Simply write a description of the nature of the trouble, tests and location, cause found, and method of repair. Payment will be made for all letters published.*

Magnets and Magnetism.

1. Lines of force take the shortest route possible. Is this correct?

2. The law governing magnetism is the same as in gravitation. Is this correct?

(1) Lines of this force *tend* to become as short as possible, but they do not do it. In the case of a horseshoe magnet the greater portion of the magnetic lines of force pass directly across the shortest path between the poles, but there are many lines which spread out all through the surrounding space.

(2) The law of attraction between the poles of two long bar magnets is the same as the Newtonian law of gravitation. The latter is that the force acting between any two bodies is proportional to the product of their masses, and inversely as the square of the distance between them. If we put the magnetic intensity of the poles in place of the masses of the two bodies, the law will hold for long magnets. They must be long enough so that the two poles of the same magnet will not appreciably affect each other.

Wave Form of Ringing Current.

The wave length of generator current and its formation would not be of any consequence except for its inductive effect on neighboring lines. Is this correct?

Not entirely correct, for the shape of the wave has something to do with the ringing ability of the machine. It is well known that the simple sine wave is the best for transmission purposes, since it possesses no higher frequencies to cause undue losses in passing over lines and through apparatus. However, a slightly peaked wave is by some considered a little better than the sine wave, as it exerts a strong pull on the bell armature and clapper at one point, thereby giving a strong hammer blow on the gong.

Reason for Spring in Generator Armature Gear.

The gear of a generator should be finely cut, have a wide face, and be practically noiseless when in use. The speed of the armature should be as nearly uniform as possible in passing through the field. Is this true, or is a coiled spring interposed between the power or crank shaft and the armature purposely to give the generator a jerky motion?

The main reason for putting the spring in the small cogwheel on the armature shaft is doubtless to secure a smoother action at the crank. It gives a much more pleasing effect to the subscriber to have the crank turn without jerks.

Education for Telephone Engineering.

(Concluded from page 634.)

fine box, like a casket for jewelry, it would take a cabinet maker several days to complete it, and perhaps the service of a silversmith as well.

If a young man has no ability or ambition to go higher than troubleman, installer, or lineman, then the one year course may do, and the trade school is the place to get it. There are numerous schools of that class scattered over our country and they are doing a faithful and commendable work along their line.

But to rise higher requires high technical ability, and something besides. We are citizens of a vast republic over which the English language holds sway. The higher a man rises in his profession, the more he is called upon to express himself in writing. Many fairly successful engineers know so little of spelling and grammatical forms that they dare not write a letter without the aid of a stenographer. Though a stenographer may cover up her employer's lack of spelling correctly, and using proper word forms, she cannot atone for his deficiencies of style. To say a thing clearly, and in good English, is a mark of self-control which should characterize every engineer. The lack of it is sure to be felt sooner or later.

In another way the slighted studies affect the standing of an engineer. There are many duties devolving on the telephone engineer which are not technically electrical. The questions arising in development studies, central office location, securing rights of way, getting franchises, securing just and favorable legislation, closing contracts, etc., call for a close knowledge of human nature and business enterprises. Any study which will broaden the mind contributes to success in this line. If you have become narrow in your work, the common interests which bind humanity together will be foreign to you. And these very things are the ones which often break the ice and give a man the entrance for the business proposition in which he is interested.

Specialization is the tendency of the day, and is all right if not pushed to the extreme. But the specialist need not be a narrow man. He can and should have a broad knowledge of men and affairs, both past and present, to enable him to take his place with other leading men of the community.

THE TELEPHONE LABORATORY.

It is natural that interest should center in the material equipment of a laboratory. In this, Purdue is very fortunate. There is a large assortment of the most common telephone parts, such as transmitters, receivers, induction coils, generators, bells, hook-switches, drops, jacks, plugs and cords, etc. Each of these is mounted on a wooden base, and provided with binding posts, so that in assembling and wiring up any circuit there may be but little delay.

The department occupies two large rooms, known as the "West Telephone Laboratory" and the "East Telephone Laboratory" respectively. Convenient work tables are located at various places in both rooms, from which circuits run to a 3-panel slate switchboard. Here any circuits may be connected by plugs and cords of large size. On this board are also located the terminals for 30 cells of storage battery, both A. C. and D. C., power generators for straight and selective ringing, etc. A small installation of automatic switches illustrates the system of the Automatic Electric Company, and gives practice in adjustment and learning the practical requirements of operation. A Kellogg 4-frequency power generator is a valued part of the equipment, together with a Roth Brothers dynamotor. A small switchboard illustrates the Stromberg-Carlson common battery switchboard and is completely wired up for service at all times. It is connected to its telephones through a Cook distributing frame. There is also a magneto switchboard from the Western Electric Company, made up of separately mounted parts, but wired in place for daily work. A common battery board with "B" operator's position is arranged in a similar manner. A small unit-type switchboard of the Sumter Telephone Manufacturing Company occupies a place on one of the walls. There is also apparatus for setting up the common battery circuits of the Kellogg Switchboard & Supply Company, and the Sterling Electric Company.

A complete three station telegraph line runs through the laboratory. Two sound-proof booths are provided, and these, with the size and arrangement of the rooms, enable students to be sufficiently separated to carry on tests by relying on the telephone alone.

A Duddell thermogalvanometer is located in a special testing laboratory, and is able to measure alternating current as low as 10 to 25 millionths of an ampere. A Rowland electrodynamometer also is part of the apparatus, enabling the measurement of the power consumed by bells, drops, repeating coils, etc. These, however, are used only by advanced students, being of too delicate a nature for ordinary use.

How He Worked It.

Mr. Whiting's telephone got out of order. Sometimes it would work, and sometimes it wouldn't. It needed attention, and Whiting said so repeatedly, but the company wouldn't do anything for him but send him a bill promptly at the month's end, and the telephone remained in a very unsatisfactory state.

Finally Whiting put his brain to work on the problem of getting his telephone repaired, and the next time he was called up, taking down the receiver, he said, mildly:

"Hello."

"Hello," was the reply. "Is this Whiting?"

"No," said he.

"Isn't this No. 713A?"

"No, indeed. It is No. 872B—Mrs. Cora Thompson."

"Oh, excuse me."

Whiting smiled and returned to his work. A minute or two passed, and he was called up by a feminine voice—the proud, haughty voice of the young lady at the exchange.

"No. 713A, isn't it?" she said.

"No, no," said Whiting.

"Isn't this Mr. Whiting?"

"No. It is Harry Smithers."

"What is your number?"

"Why, 1192, of course."

"Oh!"

Silence. Then a minute later, the telephone girl rang again.

"Hello. No. 713A? Mr. Whiting?" she said.

"No," Whiting answered in a surprised tone. "This is No. 413A."

"Oh!"

Five minutes' pause. Then:

"Hello. No. 713A?"

It was a man's voice, the manager's. Whiting, smiling grimly, answered it.

"No. This is the Globe theater."

There was an angry mutter over the wire, and half an hour later a foreman and six assistants, armed with all kinds of batteries and tools, invaded Whiting's office. When they left the telephone's defect had been repaired, and it was, for the first time in six months, in perfect condition.—*The Argonaut.*

Telephone News

Wisconsin Railway Commission Discusses Telephone Rate Discrimination.

In the report of the Railway Commission of Wisconsin, filed Dec. 7, is an announcement on the subject of discriminatory rates for telephone service which is nothing short of startling. The information embodied in the report was obtained from reports filed by the companies.

Out of sixty-one companies whose reports were received in time for compilation, thirty-two reported discriminations, and out of 147 telephone exchanges, seventy-nine tolerated discriminatory rates. Of the thirty-two companies that discriminated, the total amount of rebates amounted to $2,596.86 per month, or $31,162.34 annually. The general telephone conditions throughout the state show an average for all the exchanges considered of about eight discriminatory telephones to 100 subscribers.

A list of lines operated by the Wisconsin Telephone Company (Bell) in various cities of the state is given and it is interesting to note that twenty-one subsidary companies, or 40 per cent of the total, exceeded the general average of discrimination. Of the Independent lines reporting, only five, or 20 per cent, exceeded the average. Of the Bell subsidary lines, the highest discrimination was 74.8 per cent in the city of Shullsburg. Madison was 30 per cent, and West Bend 42 per cent. Of the Independent lines the highest discrimination was 13.9 per cent, in the city of Reedsburg, with 100 subscribers.

"Among all the companies and exchanges the situation in Madison is the most striking," said the commissioners in the report.

The Dane County Telephone Company up to September operated 681 telephones at less than the regular rates, and the Wisconsin Telephone Company operated 676 . In dollars and cents the former rendered practically $359 worth of free service per month, equivalent to rebates to that amount, as against about $760 for the latter. As a matter of comparison with the situation as a whole the following summary is of interest:

	Total telephones.	Actual charge per mo.	Correct charge per mo.
79 exchanges in state	3,366	$4,104.28	$6,701.10
2 Madison exchanges	1,357	1,933.37	3,055.70
Free service per month (79 exchanges)			$2,596.86
Free service per month (2 Madison exchanges)			1,120.38

It is thus seen that of the aggregate monthly discrimination of $2,596.86 for the exchanges included or that 43 per cent of the whole amount was chargeable to the two Madison exchanges.

Existing telephone contracts are stated to be the cause of much of the present discrimination, and the companies themselves admit that for some time to come sixty-five telephones out of a total of 3,366 cases must be maintained until the contracts are abrogated.

President Roosevelt Recommends Government Regulation of Telephone Business.

In his message just sent to Congress, President Roosevelt touches on the subject of regulation of corporations doing an interstate business, including telephone companies, in the following terms:

"Control of corporations.—As regards the great corporations engaged in interstate business, and especially the railroads, I can only repeat what I have already again and again said in my messages to the Congress. I believe that under the interstate clause of the constitution the United States has complete and paramount right to control all agencies of interstate commerce, and I believe that the national government alone can exercise this right with wisdom and effectiveness so as both to secure justice from, and to do justice to, the great corporations which are the most important factors in modern business. I believe that it is worse than folly to attempt to prohibit all combinations as is done by the Sherman anti-trust law, because such a law can be enforced only imperfectly and unequally, and its enforcement works almost as much hardship as good. I strongly advocate that instead of an unwise effort to prohibit all combinations, there shall be substituted a law which shall expressly permit combinations which are in the interest of the public, but shall at the same time give to some agency in the national government full power of control and supervision over them. One of the chief features of this control should be securing entire publicity in all matters which the public has a right to know, and furthermore, the power, not by judicial but by executive action, to prevent or put a stop to every form of improper favoritism or other wrongdoing.

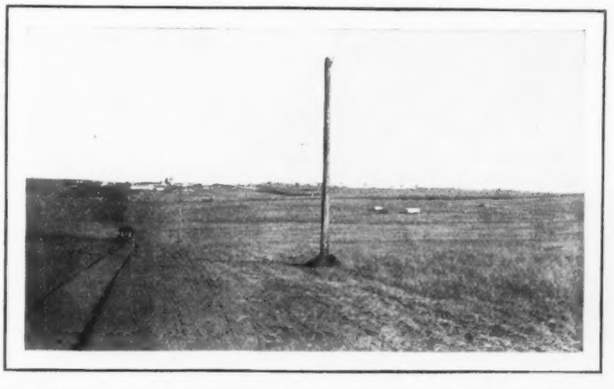
Telegraph and telephone companies engaged in interstate business should be put under the jurisdiction of the Interstate Commerce Commission.

It is very earnestly to be wished that our people, through their representatives, should act in this matter. It is to the interest of all of us that there should be a premium put upon individual initiative and individual capacity, and an ample reward for the great directing intelligences alone competent to manage the modern business operations.

There should be regulation by the national government of the great interstate corporations, including a simple method of account keeping, publicity, supervision of the issue of securities, abolition of rebates and of special privileges. There should be short-time franchises for all corporations engaged in public business.

Where the Telephone Goes Ahead of the Settler.

Facilities for speedy communication are being recognized at their full value in the great agricultural sections of America at the present time. This is strikingly illustrated by the accompanying photograph of a new telephone line, and an automobile, which shows how modern devices are carried into what, perhaps, comes as near to being the borderland of civilization as anything we have in the states.



Telephone Line Into Tripp County (S. D.) Before the Recent Opening.

This photograph was taken at the edge of the Tripp County Reservation a few weeks ago, just before it was opened up for settlement. The telephone had been built from Spencer, S. D., in anticipation of the business which would result from settlement on the reservation.

Telephone Regulation Bill Introduced in U. S. Senate.

Senator Dolliver, of Iowa, introduced in the U. S. Senate, on Dec. 9, a bill providing for the regulation of all securities issued in the future by transportation, telegraph, and telephone companies.

The provisions of the bill were explained by its author as follows: "The measure is designed to subject the future issues of stocks and bonds by transportation companies, telephone and telegraph companies engaged in interstate commerce to the scrutiny of the government of the United States. It is drawn on the theory that these corporations should be so organized that there should be some just and reasonable relation between their assets and their liabilities. It is intended to prevent, for the future, over-capitalization, stock watering, bond manipulating and all similar abuses which in times past have brought more or less disrepute upon the management of railway properties. The effect of it will be to give stability to the existing volume of railway securities and at the same time to so guard future issues as to give normal values to stocks and bonds. The bill is applicable to all corporations which are subject to existing laws for the regulation of interstate commerce. It is undertaken in the bill to make a standard of legality by which the validity of stock and bond issues may be adjudged. These features of the bill have been drawn without any intention to hinder or embarass legitimate enterprise, either of railroad building or railroad consolidation."

After defining the standard of legality the bill requires corporations subject to it when a new issue of securities is proposed, to make a full report of their proceedings in respect to them to the Interstate Commerce Commission, showing the amount and character of the securities it proposes to issue, and the purpose to which the proceeds are to be applied. The bill then provides that the Interstate Commerce Commission, after a full hearing, shall determine whether the proposed issues are in conformity to the act. In case properties are sought to be united, full authority is given to the Commission to make a valuation of the property in order that the combination may not operate to unreasonably increase the obligations outstanding. It is provided finally that securities issued without compliance with the provisions of the bill shall be considered fraudulent and void, that they shall subject the parties responsible for the unlawful issue to the penalties of the law.

Public Utilities Law in Indiana.

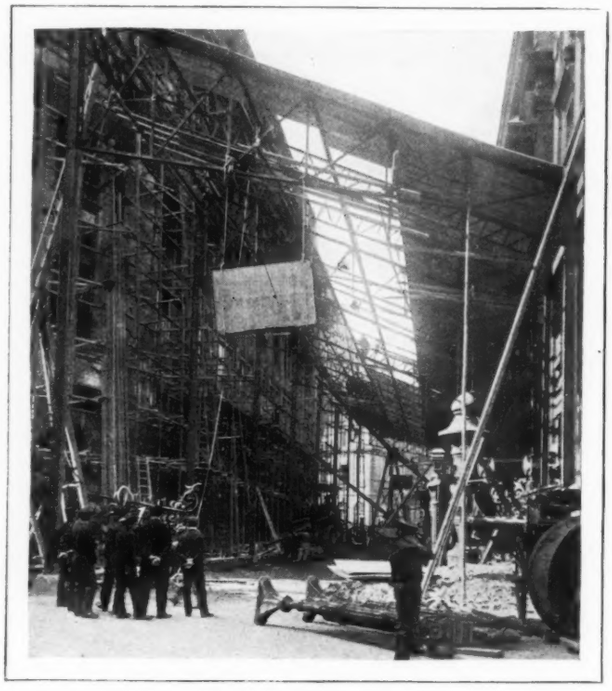
At the second annual meeting of the Indiana Association of Manufacturers and Shippers, held in Indianapolis December 10 and 11, steps were taken toward the securing at the hands of the incoming legislature of a public utilities law. This meeting was largely attended by telephone men because of their interest in and opposition to the proprosed law. According to the provisions of the proposed measure, telephone companies, telegraph companies, electric light and water works companies and kindred public utility companies will be brought under the direction, supervision and regulation of a state commission appointed by the governor. The advisibility of securing such a law brought out an animated discussion, but despite the opposition of public utilities men a committee was appointed to draft a bill and secure its passage if possible.

South Dakota Convention in January.

The annual convention of the South Dakota Independent Telephone Association will be held at Yankton, South Dakota, on January 13 and 14. A number of interesting papers are being prepared, and business is to come up which will be a subject of interest and importance to all Independent telephone men in the State.

The Temporary Paris Telephone Exchange

After the recent fire in which a telephone exchange in Paris, France, was destroyed, the authorities immediately set to work arranging for a resumption of the service. An emergency switchboard, accommodating 90 operators, was



Roofing Over a Street in Paris Providing a Temporary Exchange Building.

ordered from the United States with the understanding that it was to be delivered in Paris before November 29. To provide a temporary building for housing this large board until a new exchange building could be erected, it was determined to use the street between the destroyed building and the opposite fire department. As shown in the illustration, the street is being turned into an iron hall which will serve as the telephone exchange for many months to come.

Connecticut Public Service Commission Act Contains Provision Unfavorable to Competition.

It is suspected that the movement to establish a public service commission in Connecticut, by a bill now before the legislature, is being actively supported by the Bell Telephone Company. An undesirable feature of this bill is a section relating to the granting of franchises for new public service corporations, reading as follows:

"Such application shall be denied, in so far as the same also furnishes authority to service in any territory in which another company is actively furnishing service of like character to that for which application is made."

This section seems to be very skillfully drawn in such a manner as to make it difficult for a new company to enter a field, even though its entrance should be desired by a large part of the population who are not now receiving adequate telephone service.

Persons who are familiar with the benefits of competition will actively oppose the passage of the bill in its present form. This is a matter of interest outside of Connecticut, as it is widely believed that the attitude of the New York public service commission with respect to competition is unsound, and further advances in this line may establish a dangerous precedent for the action of such commissions in other states when they may become established.

Oklahoma Corporation Commission Active in Telephone Cases.

That the Oklahoma Corporation Commission probably intends to carry out the full provisions of the Oklahoma Constitution in regard to compelling all telephone companies conducted for hire in the state to transmit each other's messages without delay and to make physical connections for long distance purposes as laid down in the Constitution, is evidenced by the issuance of orders recently, granting the relief prayed for by the Farmers Mutual Telephone Company of Okeene with the Oklahoma Central Telephone Company, in which the complainants asked for physical connections. A like order in behalf of the People's Telephone Company of Duke which asked for physical connections with the Quanah-Mangum Telephone Company was also issued. These connections were not between competing companies in the same territory, but rather between companies occupying adjacent territory.

Central Union Gives Up Dual Connection.

The *Bulletin*, Bloomington, Ill., December 8, contains the following:

"The Farmers' Telephone Company, of Pontiac; Cornell Telephone Company, of Cornell, and the Western Telephone Company, of Weston, a total of over 600 subscribers, have been disconnected from the Bell Telephone Company on account of their connection with the Automatic Home Telephone Company, of Pontiac, presumably as those interested in the latter company expect to suppress other farmer companies from making similar arrangements. The disconnection was made last Saturday."

A Correction.

Owing to a typographical error in our issue of November 21, the captions of two of the illustrations of Figs. 48 and 49 on page 508 were transposed. The caption "Fig. 48, Voltmeter or Ammeter Circuit for the Test Board" should have been placed under the lower illustration and vice versa.

Telephone Litigation Receives Wide Publicity.

Since the granting of the injunction preventing their competitor from interfering with the business of Independent exchanges reached by the lines of the U. S. Long Distance Telephone Company, wide publicity has been given to this notable Independent victory. Not only did the great daily papers in the large cities print this news, but through the activity of officers of State Independent telephone associations, and managers of Independent exchanges who furnished statements to hundreds of local papers, the public has been well informed of the points set forth in the bill which brought the injunction. One Iowa manager even translated the statement prepared by Secretary Thill, so that it was printed in a German newspaper. Prompt and valuable work in the distribution of this information to the daily press was done by Mr. E. B. Fisher, Grand Rapids, Mich.; D. A. Walker, president of the Texas Independent Telephone Association; G. W. Schweer, secretary of the Missouri Independent Telephone Association, and others.

Indiana Independents Will Enforce Obedience to Anti-Monopoly Injunction.

The Independent telephone interests of Indiana are planning to see that the order of the Federal District Court of Ohio and Indiana, restraining the Central Union Telephone Company from establishing connections with Independent companies after inducing the Independent companies to break contracts providing for exclusive connection with the United States Telephone Company is carried out fully.

The Central Union has already obeyed the order in some localities, but it will be the business of the Independents to see to it that such arrangements are abandoned all over the state where found to exist.

Public Service Commission for Connecticut.

In a report of the special committee appointed at the last Legislature the establishment of a public service commission for Connecticut is advocated. The duties are generally defined in the report as follows:

"The commission shall have the general supervision of all railroads, street railways, gas, electric, water, express, telephone and telegraph companies, in so far as they are subject to State control, and shall keep itself fully informed as to the compliance with law by said companies, and when deemed necessary, shall report violations of the law to proper officials having jurisdiction of such violations."

Obituary.

Mrs. Eliza McGuire Haase, who died December 8, 1908, was the mother of Allen Lee Haase, the well-known representative of the Harvard Electric Company.

Damage to Heavy Open Wire Lead From Fire.

The Scott County Telephone Company, at Scottsburg, Ind., is the owner of the 120-wire pole lead which was damaged as shown in the accompany illustrations.

Scene of a Fire in Scottsburg, Ind., Showing Damaged Pole Lead and Repair Wagon and Men Ready to Repair the Lines.

A big fire on October 16 put the line out of commission. One of the photographs shows the company's repair wagon on the ground, ready to start on the work of restoring service, even before the fire was out.

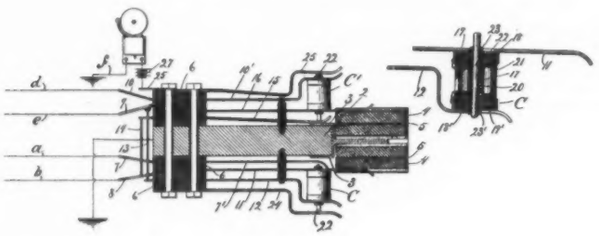
Telephone Patents

Conducted by Max W. Zabel

PROTECTIVE APPARATUS FOR SWITCHBOARDS AND THE LIKE.

Wm. Kaisling, Chicago, Ill., patent 904,486, Nov. 17, 1908.

This thermal protector consists of the ordinary heat element, consisting of the coil 17, which is arranged to soften the solder which holds the central pin, 22, in place. When the heat is



sufficient to melt the solder, the pin 22 is pushed inwardly and grounds the circuit. Then by merely reversing the heat coil, it is again ready for operation.

COMBINED TELEPHONE EXCHANGE AND ALARM SYSTEM.

J. M. Latimer, Philadelphia, Pa., patent 904,441, Nov. 17, 1908.

This patent is intended to cover a combined telephone exchange and alarm system, and the arrangement is such that relays of special design are provided for each line at the central exchange, so that telephone communication can be carried on by means of the relays without actuating the alarm mechanism, or the alarm features can be put in operation to send a signal to a fire or police alarm station without affecting any of the telephone appliances used for the telephone circuits.

TELEPHONE SYSTEM.

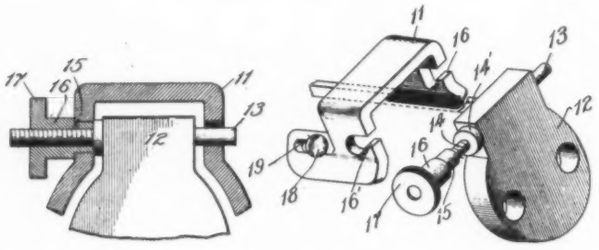
H. G. Webster, Chicago, Ill., patent 904,583, Nov. 24, 1908.

This patent covers a common battery telephone system, in which means are provided for shunting the relays in the talking circuit with non-inductive shunts. The theory of this is that after the relay has been drawn up, it requires less current to hold it in place than to operate it, and the shunting of non-inductive resistances around the relay does not injuriously influence its operation, yet at the same time a path for talking current around the relay is provided.

TELEPHONE ANNUNCIATOR AND JACK.

H. Tideman, Menominee, Mich., patent 904,903, Nov. 24, 1908.

A removable mounting for the armature of a drop is disclosed in this patent, and consists of the armature 12, which



has projecting shaft 13, and a second threaded shaft 14, which fit into the mounting 11. When the knurled thumb-piece 16 is inserted into the groove 16', it occupies the entire space in that groove, and the armature cannot be removed.

When it is desired to remove the armature, the thumb piece 16 is unscrewed and the armature can be taken out through the slots in the rear of the piece 11.

SHIELD FOR MOUTHPIECES OF TELEPHONES.

T. M. LaJord, New York, N. Y., patent 905,330, Dec. 1, 1908.

This patent covers a sanitary shield for mouthpieces, consisting of a punched plate somewhat in the shape of a Maltese Cross, each of the legs being adapted to engage the mouthpiece when bent over. The center of the cross has a circular hole over which an absorbent shield is placed.

TELEPHONE RECEIVER.

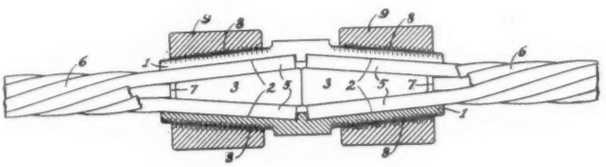
N. Baldwin, Heber, Utah, patent 905,781, Dec. 1, 1908.

To provide means whereby the magnetic flux in the permanent magnet should not be affected by the change of polarity in the alternating currents coming over the line, each pole of the permanent magnet of a receiver is formed with a set of pole pieces having two opposing legs, which straddle the armature. The several coils are wound and connected up so that the magnetic effect is produced first on one side of the armature, whether such armature be of the diaphragm itself or be connected to the diaphragm, and then upon the other side of the armature.

CONNECTOR FOR ELECTRICAL CONDUCTORS.

F. B. Cook, Chicago, Ill., patent 901,422, Oct. 20, 1908.

An improved connector for electrical conductors is the subject matter of this patent, and consists of a split sleeve 8, hav-



ing a tapered thread provided with tapered nuts 9, and a center core 3. The strands of the conductor are placed between the core 3 and the split sleeve 8, and the nuts 9 screwed in place.

CABLE TERMINAL.

J. E. McMeen, Galesburg, Ill., patent 905,347, Dec. 1, 1908.

This cable terminal is mounted directly upon the cable, the terminals being protected from the weather by a suitable housing, and the conductors within the cable protected from undue electrical conditions by proper fuses conveniently mounted within the protecting housing.

The lead sheath is stripped from the cable at the point where the terminal is to be placed, and a sleeve containing the terminals is mounted, so that leads can be taken off of the various cable pairs.

COMBINED DROP AND JACK.

E. E. Yaxley, Chicago, Ill., patent 905,619, Dec. 1, 1908.

This invention contemplates the removal of the drop winding without removing the containing tube from the mounting. The jack construction is provided with connecting bars which are attached to the terminals of the coil, and when these connecting rods are removed the coil can be taken out.

A spring arrangement is provided for adjusting the pull which is necessary for the operation of the shunter-arm.

In the Manufacturing Field

A Vapor-Burning Kerosene Lamp.

Wonderful advances have been made in the development of hydro-carbon lighting. Up to this time the efforts expended in this direction have been principally with gasolene. Now comes a success with kerosene.

The illustrations show a lamp provided with a kerosene burner so constructed that it vaporizes kerosene, and burns it on a mantle with the same perfect results as are obtained by the use of a mantle on a gas burner. Where gas or electricity is not available lamps, commonly known as central draft, are used extensively. One or more of them may be found in nearly every home, store, office, church, in fact, everywhere that kerosene is used for light. They were welcomed by the people owing to their increased light production over the old style flat wick lamps. They however, proportionally increased the consumption of oil. Now we have an "incandescent" kerosene lamp burner. It is claimed for this burner that it will produce a light equal to six incandescent electric bulbs, at one-twentieth the cost. It is said that it will not consume more than one pint of oil in eight hours, as against three pints of oil in the same length of time by a central draft lamp, yet it will produce a light equal to three central draft lamps.

The burner, as shown in Fig. 1, can be attached to any ordinary lamp, hanging fixture, or in any way to make it the most convenient to use. It is known as the Ideal incandescent kerosene burner, and is the product of the Acorn Brass Mfg. Co., 53 N. Peoria street, Chicago. This concern is said to be the largest and oldest concern dealing in hydro-carbon lighting equipment. Its gasolene lighting systems are to be found in all parts of the world.

Credit is due to Mr. F. A. Lundquist, with whom telephone men are well acquainted, for the introduction of this lamp. Mr. Lundquist, who so materially assisted in bringing out the automatic telephone system, and whose patents along this line are numerous, considers the light question next of importance to the telephone. He is now,

Fig. 1—The Ideal Incandescent Lamp and Burner.

therefore, also interested with the Acorn company and is the manager of that part of the establishment known as the Ideal Lamp Department.

It is obvious that this method of producing light will practically revolutionize present methods, not only in the rural districts and small towns where this burner is rapidly displacing all other methods of lighting, but it is also destined to become, and in fact already is, used extensively in the cities and places where gas and electricity are available, owing to the great reduction in cost of light made possible by the use of this burner. The principle upon which this burner produces an incandescent light is different from all other methods used in hydro-carbon lighting. With this burner no pressure of any kind is required, and no preheating is necessary. The wick, as shown in the illustration, extends from the oil the same as in ordinary lamps. The capillary action of the wick supplies oil to the vaporizer, which is attached around the upper end of the wick tube. Air passing through the vaporizer, as well as through the air intake at the side of the tube, becomes mixed with the vapor of the oil from the end of the wick, and thus forms a gas which passes upwards into the mantle. The draft caused by the chimney and the proper perforations in the outer casing, together with the perforated spreader and vaporizor, promotes the continuation of the vapor and does, therefore, not burn a flame at all, as other lamps do. At first, however, the wick is lighted, but in a few moments it automatically changes from a flame to vapor, gradually increasing the glow of the mantle until it is perfectly incandescent.

It is said that it is the only burner of this kind that will become normal in a few moments after lighting, and that it will remain so indefinitely without increasing or decreasing. It is unlike other kerosene burners in as much as there is not the slightest odor from it, and no sound.

The mantles supplied for these burners are made a great deal more substantially than those used on gas in order to withstand the rough handling they are liable to receive when used as portable lamps.

Some Evidence of Returning Prosperity.

During the past thirty days Frank B. Cook, of Chicago, has received orders for protectors and terminals from the telephone companies in the following places:

Oskaloosa, Ia.; Akron, Ohio; Tyler, Tex.; Altamont, Ill.; Lexington, Ky.; Harrisonburg, Va.; Rolla, Mo.; Havelock, Neb.; Manhattan, Kan.; Charleston, W. Va.; St. Louis, Mo.; Manhattan, Kan.; Clinton, Ill.; Belgrade, Neb.; Cresco, Ia.; Humboldt, Ia.; Lexington, Mo.; Clarence, Mo.; Hornell, N. Y.; Wamego, Kan.; Kansas City, Mo.; Windsor, Mo.; Washington, Pa.; Butte, Mont.; Eldora, Ia.; Beatrice, Neb.; Cedar Rapids, Ia.; Mankato, Minn.; Franklin, Minn.; Greenwood, S. C.; Windsor, Mo.; Portland, Ore.; Merrill, Wis.; Cambridge, Neb.; Englewood, Ill.; Smith Center, Kan.; Laingsburg, Mich.; St. Louis, Mo.; McMinnville, Ohio; Hamilton, Ohio; Buffalo, N. Y.; Nelsonville, Ohio; Peckville, Pa.; Herrington, Kan.; Kinsley, Kan.; Platte, S. D.; Oakland, Cal.; Aledo, Ill.; Tyler, Tex.; Wellington, Ohio; St. Louis, Mo.; Red Oak, Ia.; Monticello, Ill.; Lone Wolf, Okla.; Woodbine, Ia.; Plainview, Tex.; Laconia, N. H.; Junction City, Kan.; Aberdeen, S. D.; Marble Falls, Tex.; South Bend, Ind.; Plano, Ill.; Mankato, Ill.; Clinton, Ia.; Dundurn, Sask., Can.; Soldier, Kan.; Lockwood, Mo.; Webster City, Ia.; Kenton, Ohio; Broken Bow, Neb.; Johnson City, Tenn.; Mound City, Kan.; Norwalk, Ohio; Grinnell, Ia.; Corvalles, Ore.; San Antonio, Tex.; Des Moines, Ia.; Covington, Ind.; Pacific, Mo.; Bird Island, Minn.; Mt. Vernon, Ohio; Junction City, Kan.; Hays, Kan.

It will be noticed that these orders are from every section of the country, although those from Western cities predominate. This would indicate that prosperity, while gradually returning to all parts of the country, is more in evidence in the West.

Condensed News Reports

Officers of companies are earnestly requested to forward us promptly all financial and other statements as soon as issued and any items of interest as to their plants and systems

PERSONAL.

MR. L. D. BRAINARD of Oneonta, N. Y., has been appointed manager of Home Telephone Company of Dunkirk, N. Y.

MR. J. C. GIBSON has been appointed manager of the Toledo, Ohio, exchange of the Central Union Telephone Company.

MR. SILAS LINVILLE of Hooker, Okla., has been appointed manager of the Tyrone Telephone Company of Tyrone, Okla.

MR. WESLEY PRISER has assumed the management of the plant of the Dunlaps Mutual Telephone Company at Dunlaps, Indiana.

MR. CHARLES BENNETT has been promoted to the managership of the Nebraska City Telephone Company of Nebraska City, Neb.

MR. J. W. CHERRY of Toledo, Ohio, has been appointed manager of exchange of the Urbana Telephone Company at Urbana, Ohio.

MR. F. J. BICKNER of Minneapolis, has been appointed manager of the Northwestern Telephone Exchange Company's office at New Ulm, Minn.

MR. WILLIAM ROBBINS McGOVERN has been appointed chief engineer of the Wisconsin Telephone Company, with headquarters at Milwaukee, Wis.

MR. SUMNER LLOYD of Fayetteville, Tenn., has been promoted to the managership of the Cumberland Telephone and Telegraph Company at Winchester, Tenn.

MR. C. F. LAMBERT, formerly manager of the Nebraska Telephone Company at Nebraska City, Neb., has been promoted to the managership of the company's exchange at Hastings.

MR. CASPAR OLSTAD has been transferred from the managership of the Northwestern Telephone Exhange Company at New Ulm, Minn., to that at Eveleth, Minn.

MR. H. R. FRAZEE, local manager for the Peninsular Telephone Company of St. Petersburg, Fla., has recently been elected one of the board of aldermen.

MR. HOWARD H. HERR, who has for six years been manager of the Ottumwa Telephone and Electric Company, of Ottumwa, Ia., on his retirement a few days ago, was presented with a handsome gold watch fob, and the presentation was made the occasion for the expression of hearty good wishes from all the employees.

NEW COMPANIES.

BROOMFIELD, ARK.—A new rural telephone company has been formed at Broomfield. William Dollar will be president, and James Turner, secretary and treasurer. The construction of the plant will commence as soon as the material arrives.

BOISE, IDAHO.—The Reubens Rural Telephone Company of Reubens, Nez Perce county, has been incorporated with a capital stock of $2,000. The incorporators are: James Bonnallie, A. T. Paige, C. Chambers.

PARK, KAN.—The Park Telephone Company, of this city, has been incorporated with a capital stock of $10,000.

ADAIR, MICH.—A new telephone company has been organized in this place which is to be known as the Casco Roadway Company. The officers are: President, Louis Maedel; vice-president, William Eschenberg; secretary, Henry Lutes; treasurer, Joseph Cobbledick, trustee, George Seifert.

SAGINAW, MICH.—The Valley Home Telephone Company, a corporation which is to take over practically all the Independent telephone interests in northeastern Michigan, including the exchanges at Saginaw, Bay City and Flint, has just been organized. The authorized capital of the new company is $2,500,000, divided into 25,000 shares. The board of directors has been announced as follows: Fred T. Woodwarth, E. F. Carrington, George E. Wedthoff and L. W. Kessler, all of Bay City; John L. Jackson, John F. Brand, C. O. Trask and John J. Speed, Saginaw; R. B. McPherson, Howell; James B. Gibbs, Ithaca, and Charles W. Liken, Sebawaing. The following officers have been elected: president, E. D. Carrington, Bay City; vice-president, John L. Jackson, Saginaw; secretary, C. O. Trask, Saginaw; treasurer, J. F. Bond, Saginaw.

MINNEOTA, MINN.—A new company has been formed to erect a rural telephone line from this place to Nordland. C. K. Melby will be president, and L. S. Teigland, secretary.

CULBERTSON, MONT.—Articles of incorporation of the Dakota Western Telephone Company, of Culbertson, have been filed by H. C. McCartney and others. The capital stock is placed at $200,000.

BARTLEY, NEB.—The Bartley Mutual Telephone Company of this place has been chartered with capital stock of $12,000 by Edward Sughrause, D. L. Wolf and others.

COTTONWOOD GROVE, NEB.—The Cottonwood Grove Mutual Telephone Company, of Dawson county, has recently been organized with a capital stock of $700. The incorporators are: John Henry, J. H. Hover, and others.

BELFIELD, N. D.—R. C. Davis, O. F. Olson, Ed. O'Connor, and others of this city, are the incorporators of a new telephone company which is to be known as the Belfield and Northwestern Telephone Company. The capital stock is given as $5,000.

COLUMBUS, OHIO.—The Leipsic Mutual Telephone Company of Leipsic has been incorporated by George Gores, W. W. Dibble, A. J. Hoffan and others.

LEWISTOWN, PA.—A new organization has been formed in this city, to be known as the Lewistown Rural Telephone Company. This company has been incorporated with a capital stock of $5,000.

PIERRE, S. D.—Articles of incorporation have been filed for the Union Township Telephone Company, with headquarters at Ipswich, and a capital of $10,000. The incorporators are: S. W. Mount, E. L. Bucklen, John Sloan, H. Strouble, George Fritz, all of Union township, Edmunds county.

TYRONE, TEXAS.—The Farmers' Telephone Company, of Tyrone, Texas, has been organized with a capital stock of $2,000. The officers are: W. M. Atkins, president; Wm. Dixon, vice-president; Robert Harville, treasurer.

UNIONTOWN, WASH.—A new company has been formed, to be known as the Uniontown Telephone Company, by Lamber Taufen, W. W. Miller and George A. Drissel. The capital stock is $5,000.

BARTON, WIS.—The Barton Rural Telephone Company has been incorporated with a capital stock of $300. The incorporators are Henry Albright, Frank Mueller and William Lexenberger.

CAMBRIDGE, WIS.—The Farmers' Equity Telephone Company of Cambridge has been incorporated with a capital stock of $4,000. The incorporators are: J C. Hanson, John Christianson and James E. Hill.

FOND-DU-LAC, WIS.—The Eldorado and Friendship Telephone Company has been organized to establish telephone service in the places named. The capital stock of the new company is placed at $5,000, and the incorporators are: Jas. Reilly, W. H. Keys, L. G. Barnes, Wm. C. Ray and W. P. Reilly.

LEBANON, WIS.—The Lebanon Telephone Company, of Lebanon, has been incorporated with a capital stock of $10,000. The incorporators are: Henry C. Uttich, August H. Maas, and August C. Neitzel.

FINANCIAL.

PITKIN, COL.—The Pitkin Telephone Company at its annual meeting, which was recently held, declared a dividend of 5 per cent.

FRANCHISES.

CRIPPLE CREEK, COL.—E. S. Sterett of Henry, Ill., has petitioned the city council for a franchise to establish a new telephone system in Cripple Creek.

MOUNDS, ILL.—At a recent meeting of the town council, the Home Telephone Company, of Cairo, was granted a 20-year franchise.

ALBANY, MO.—Permission has been granted J. H. Jones, J. B. Grace, and others, to erect a telephone line along the public highways in this place.

LEXINGTON, MO.—The Kansas City Long Distance Telephone Company has presented an ordinance to the city council, asking for right to construct, operate and maintain long distance lines at certain points in Lexington.

RICH HILL, MO.—D. B. Hickey has asked for a franchise to install a modern and up-to-date telephone system in this place.

SPRING BLUFF, MO.—P. E. Gerber has been granted permission to erect telephone poles along the county road leading from this town to Leslie.

UNION, MO.—Permission has been granted F. W. Merk to erect telephone lines along certain county roads in the western part of Franklin county.

PHELPS, N. Y.—A new franchise has been granted the Phelps Home Telephone Company by the board of village trustees. Rep-

resentatives of the company state that the telephone system here will be rebuilt and enlarged.

ADA, OKLA.—At a recent special election the Farmers' Independent Telephone Company, a local company, was granted a franchise for the use of the streets for a period of twenty-five years.

CONSTRUCTION.

MARION, ALA.—The work of constructing the new rural telephone line from Marion to Newberne, a distance of about twenty miles, is progressing rapidly.

WARREN, ARK.—The extension of the line from Warren to Hermitage, by way of Banks, has just been completed by the Valley Telephone Company.

CLAREMONT, CAL.—A new switchboard has been ordered by the Home Telephone Company for its local exchange at Claremont. The company is also planning to install a new exchange at San Dimas.

SAN FRANCISCO, CAL.—The Home Telephone Company is planning to build a new exchange building, to be located on Albion avenue and Seventeenth street. The building will be of brick, one story in height, and will cost $25,000.

KOOTENAI, Ida.—The Interstate Independent Telephone Company has extended its line into Kootenai and is ready for business.

BARTELSO, ILL.—The Citizens' Telephone & Telegraph Company, of Clinton County, has completed its line from Germantown to Bartelso.

CORTLAND, ILL.—The County Telephone Company has extended its line from Cortland to Sycamore.

GRANTFORK, ILL.—The Grantfork Rural Telephone Company is improving its line running east from the town along the newly built township road.

HARMON, ILL.—Plans for the construction of a direct line from Harmon to Ambay are being considered by the directors of the Green River Telephone Company.

MERRILLVILLE, IND.—A new switchboard has been installed at this place by the Crown Point Telephone Company.

AMES, IOWA.—The extensive improvements being made by the Mutual Telephone Company on its exchange have just been completed. About 8,000 feet of cable has been strung, replacing the open wire leads. During the past few months the company has also installed about 10,000 feet of cable in this place, both aerial and underground.

MUSCATINE, IA.—The Mississippi Valley Telephone Company has just completed an extension of its lines to Columbus Junction.

NEWTON, IOWA.—The Jasper County Telephone Company is making many improvements in Newton, replacing poles and stringing wires in the main streets of the town.

STRUBLE, IA.—The Plymouth Telephone Company will install an additional switchboard in the local exchange.

KIOWA, KAN.—The Kiowa Telephone Company is having a new switchboard installed in the local exchange.

PITTSBURG, KAN.—Two new rural telephone lines are being built on route 5, south of the city, to connect with Pittsburg.

BAY CITY, MICH.—The Union Telephone Company is extending its line from Hope to Edenville, Curtis and Coleman.

WYANDOTTE, MICH.—The Interstate Telephone Company is preparing to install an exchange in this place.

BUFFALO, MINN.—A new company has been organized to construct a telephone line on the St. Michael and Hanover road. This company will be known as the East Buffalo Rural Telephone Company.

HARDWICK, MINN.—The South Dakota Rural Telephone Company has built a new exchange at this place and extended the rural lines in the vicinity of Hardwick.

ROCKSBURY, MINN.—The Farmers' Mutual Telephone Company is planning to extend its telephone lines in this vicinity.

CAPE GIRARDEAU, MO.—The Cape Girardeau Telephone Company has just completed a copper circuit from Cape Girardeau to Advance, Mo., connecting at the latter place with the newly organized Advance Telephone Company. The line is twenty-six miles long, and passes via Delta, Arbor, Nash, Sharpsboro and Blomeyer, Mo.

DOWNING, MO.—A number of the farm lines of the Downing Telephone Company will be entirely rebuilt this winter.

GRANT CITY, MO.—Improvements are being made on the telephone system here; cable is being strung, and the central office moved to another building.

PLEASANT HILL, MO.—The Pleasant Hill Telephone Company has just installed a new switchboard.

WEATHERBY, MO.—A switchboard is being installed in Weatherby by the Independent telephone company.

VICTOR, MONT.—Exchanges will be installed at Victor and Corvallis by the Bitter Root Telephone Exchange Company.

BEATRICE, NEB.—The New Home Telephone Company is constructing a line to Portland and Pickrell.

BEATRICE, NEB.—The New Home Telephone Company, of Beatrice, is building a line into Cortland. This line will then join the line recently built by the Lincoln company.

OMAHA, NEB.—It is reported that the Independent telephone company is contemplating an expenditure of $1,000,000, to be used for extensions and improvements.

CHESTER, N. Y.—At a recent meeting of the directors of the Chester Telephone Company, it was decided to spend a large sum of money in improvement and enlargement of the lines.

ITHACA, N. Y.—The New York, Auburn & Lansing Interurban Railway Company is installing a telephone line between this city and Auburn, and announcement has been made that telephones would be used by this company instead of the telegraph. There will be a telephone in every station along the line and the movement of cars will be directed by telephone.

HANWOOD, N. D.—The Reed and Remert Township Farmers' Telephone Company, of which O. K. Hanson is president, has about twenty-five miles of line under course of construction.

LANGDON, N. D.—Work on the construction of a telephone line between this city, Nekoma and Loma will be started in the spring.

WAURIKA, OKLA.—Work has now commenced on the extension of the telephone lines in Waurika. Over 7,000 feet of cable will be strung and other improvements made.

BEAVER FALLS, PA.—The Beaver County Telephone Company has opened its long distance lines to Pittsburg and other points for business.

NEW WILMINGTON, PA.—The New Wilmington Telephone Company is building several new lines in the surrounding country.

PECKVILLE, PA.—The Consolidated Telephone Companies of Pennsylvania (now a part of the system of the American Union Telephone Company) are installing a Stromberg-Carlson common battery system with four-party selective ringing in Peckville and Jessup, Lackawanna county, Pa. A board with an ultimate capacity of 100 central energy and 20 magneto lines is being installed. The company's subscribers in Archbald, Pa., 2½ miles distant, will be served by the new exchange through a 25-pair cable. The new exchange service was inaugurated on November 15th with 50 old and 100 new subscribers. Additional toll circuits to Scranton and Carbondale are also being constructed.

PLAIN GROVE, PA.—The growth of the Plain Grove Telephone Company has been very evident during the past year. Many new pole lines have been constructed, and the subscribers' list has increased considerably.

DEADWOOD, S. D.—The Burlington Railroad is shortly to commence the work of installing the telephone for train dispatching throughout its system in the Black Hills. The Burlington operates nearly 200 miles of road in the Hills and it is hoped to have the new system in operation before spring.

GARRETSON, S. D.—The South Dakota Rural Telephone Company has installed new office equipment in the local exchange and also improved the outside plant so that the entire system is now thoroughly up to date. Mr. Theo. Holien is the secretary of the company.

ALEXANDRIA, TENN.—The local system of the Gainsboro Telephone Company is rapidly nearing completion.

CAPE CHARLES, VA.—The New York, Philadelphia and Norfolk Railroad has announced that it will immediately install a telephone system for the dispatching of trains.

SPOTTSYLVANIA, VA.—The Fredericksburg, Wilderness & Orange Telephone Company commenced the work of building a telephone line which, when completed, will connect several of the surrounding counties.

NORTH YAKIMA, WASH.—A company has been organized to build a telephone line from White Bluffs to Kennewick, Wash., a distance of 50 miles. Capital for building the telephone line will be furnished by the White Bluffs Land & Irrigation Company.

TROY, WASH.—The Interstate Independent Telephone Company is constructing a line which will connect Troy with Dreary. Several farm lines will be connected with this line and connections will also be made with Helmer and Avon.

PARSONS, W. VA.—The Cheats Valley Telephone Company has contracted for the construction of a line between St. George, in Tucker county, and Kingwood.

SULLIVAN, WIS.—The stockholders of the Sullivan Telephone Company have elected the following directors: Paul R. McKee, W. E. Blumenstein, John Friedel of Rome, Wm. Bell of Concord, and Mr. Carman of Hebron.

WAYSIDE, WIS.—The Wayside Telephone Company has completed the first section of its line. The company will soon build an extension through Maple Grove. The officers are: Joseph Hoffman, president; Thomas Monohan, secretary, and John Natzke, treasurer.

DOUGLAS, WYO.—Plans are under consideration for the construction of an Independent telephone line from Chadron, Neb., to Lander, Wyo., which will supply the towns of Shoshoni, Riverton, Douglas, and Casper. At Lander this line would connect with the Pinedale Independent, making an Independent line across the State.

WHEATLAND, WYO.—A telephone line is being constructed by the Wyoming Development Company from Wheatland to the company's reservoir on the Laramie Plains. This line will bring a number of ranches into communication with the town.

EDMONTON, ALB., CAN.—Since May the provincial government has constructed 600 miles of long distance telephone lines

and 60 miles of rural lines. All the larger and most important centers in the province are now connected by the government telephone system. There are now 165 exchanges and toll stations in the province against 35 at the beginning of the year. A number of additional long distance lines will be built next year.

SASKATOON, SASK., CAN.—A deputation from the board of trade will petition the government to build a telephone line along the railways both east and west of this city.

SARNIA, ONT., CAN.—The rural telephone system for the townships of Moore and Sombra is being pushed to completion as rapidly as possible. The poles have been laid along the proposed lines, and it is expected the farmers will be enjoying telephone service in a few weeks.

SEELEY'S BAY, ONT., CAN.—The Leeds Rural Telephone Company has decided to extend its lines into Pittsburg, Ont.

ELECTIONS.

NEVADA CITY, CAL.—At a recent meeting of the Forest Spring Telephone Company, W. J. Sanford was elected president; P. P. Pingree, secretary, and T. W. Noell, treasurer.

DIXON, ILL.—At the annual meeting of the Dixon Home Telephone Company, the following officers were elected for the ensuing year: J. C. Flowers of Joliet, president; E. N. Howell, vice-president; W. C. Durkes, treasurer; C. B. Cheadle of Joliet, secretary. Directors, W. C. Durkes, E. N. Howell, and Geo. B. Cary, Joliet.

EMMETSBURG, IA.—At the annual meeting of the stockholders of the Emmetsburg Telephone Company, the following directors were elected for the ensuing year: George McCarty, Frank Dealy, Frank Freeman, W. I. Brannagan, J. K. Benda, E. A. Morling and E. G. Kelly.

FOREST CITY, IA.—The stockholders of the Winnebago Telephone Company have elected the following directors: A. N. Branstad and E. J. Wartchow, one year; J. E. Howard and N. P. Nelson, two years; H. J. Hanson, C. A. Isaacs and Ray Jacobs for the three year term.

COLDWATER, MICH.—The South Butler Independent Telephone Company, at the annual meeting, retained the same officers for another year, viz., Riley Craft, president; W. F. Ramsdell, vice-president; H. P. Wilmarth, secretary; M. L. Hammond, treasurer.

ST. JOHN, MICH.—The following officers were elected for the ensuing year by the Westphalia Rural Telephone Company: John P. Gross, president; Fred Belen, secretary; Ferdinand J. Platte, treasurer. Directors, Jos. Platte, I. A. Trierweller and John Lenneman.

PAPILLION, NEB.—The following officers have been elected by the Sarpy Mutual Telephone Company: S. Startzer, president; E. L. Ireland, secretary, and Fred Krambeck, treasurer.

TRENTON, N. J.—At the annual meeting of the Inter-State Telephone and Telegraph Company the following officers were elected: H. R. Swartz, president; William S. Hancock, secretary-treasurer.

PERRY, OKLA.—At the annual meeting of the Perry Northwestern Telephone Company, the following officers were elected: P. B. Woolfinger, president; Ben Hughes, vice-president; Linsey Murdock, secretary; Arthur Hoppe, treasurer. Directors, W. M. Merriman, T. A. Kiser, Will Mason, John Shay and John Crane.

WEHR, PA.—The Mahoning & Lizard Creek Rural Telephone Company elected the following officers at a recent meeting: W. A. Wertman, president; W. S. Longacre, vice-president; Dr. E. E. Weissner, secretary; Jacob Zehner, treasurer. The directors are John Brown, George Fenstermacher and Lewis Steigerwalt.

SUNNYSIDE, WASH.—At the annual meeting of the Yakima Valley Telephone Company, these directors were elected: H. M. Gilbert, of Toppenish; J. F. McCurdy, of Parker; J. D. Laughlin, of Zillah; R. K. Tiffany, of Sunnyside, and U. N. Lancy, of Belma. Mr. Gilbert will be probably president when the board organizes.

BLUEFIELD, W. VA.—The Graham Telephone Company has elected the following officers: President, R. L. Gillespie; secretary and treasurer, P. J. Ritter; general manager, Dr. Carl Greever, of Tazewell.

HARTFORD, WIS.—The Hartford Rural Telephone Company has elected the following officers: E. M. Anderson, president; Daniel Schultz, vice-president; A. W. Brown, secretary; Michael Reik, treasurer.

WEST BEND, WIS.—At a recent meeting of the Barton Rural Telephone Company, the following officers were elected: Wm. Ostrander, president; Frank Mueller, vice-president; H. Albright, secretary-treasurer. The directors are M. Mueller, J. Bohlen, A. Wichman, P. Leinberger and Wm. Leinberger.

MISCELLANEOUS.

JACKSONVILLE, FLA.—The Southern Bell Telephone and Telegraph Company plan to increase its rates in certain sections of this city. The city council has appointed a committee to investigate the proposed measure.

HOFFMAN, ILL.—The Hoffman telephone system has been purchased by the Sigel Mutual Telephone Company.

MORTON, ILL.—The Farmers' Mutual Telephone Company has completed arrangements whereby it will connect with the Citizens' Telephone Company of this city. The Farmers' company was organized last summer and now has 100 instruments in operation and within the next six months hopes to increase the number to 700.

CEDAR RAPIDS, IA.—The Cedar Rapids & Marion Telephone Company recently purchased a building lot and is contemplating the erection of a two-story brick telephone building.

MT. VERNON, IA.—A. Bunham has sold the Oxford Junction telephone system to Otto Wettstein, Jr., of La Porte City, Iowa, and F. H. Shimanek, of Oxford Junction.

BREAUX BRIDGE, LA.—Dr. A. J. Dauterive and Collins Conrad have recently absorbed the interest of J. R. O'Donohoe in the Breaux Bridge-St. Martin Telephone Company. Mr. C. Conrad is now president and general manager and Dr. A. J. Dauterive secretary-treasurer. The company has just cut in four new pay-stations in different sections of St. Martin Parish, never before reached by wire, two of which are thriving incorporated towns.

KINGSVILLE, MO.—It is reported that a farmers' telephone company which will include four of the lines centering at this place, is to be incorporated under the state laws.

BALDWINSVILLE, N. Y.—The Onondaga Independence Telephone Company has bought the Baldwinsville Independent Telephone Company and now has an exchange in every village in Onondaga county.

MOTT, N. D.—The Dakota & Montana Telephone Company has purchased the Cannon Ball Telephone Company at this place.

VOLANT, PA.—The annual meeting of the Plain Grove Telephone Company was held recently and reports were presented by the treasurer and auditor, showing a prosperous year's business. No change was made in the board of directors except that Joseph M. Burton was elected to fill a vacancy. This company recently renewed their contract for long distance connection with the American Union Telephone Company.

COMMERCE, TEX.—The system of the Commerce Telephone Company has been purchased by J. W. Shipman, who intends to rebuild the entire plant.

OAKVILLE, TEX.—A. J. Moore, of San Antonio, owner of the Eureka telephone system, has bought the lines and equipment of the rural telephone system, formerly belonging to E. J. Atchley, and is preparing to overhaul the property.

CUMBERLAND, WIS.—The McKinley Telephone Company has decided to extend its operations so that it will include all the territory tributary to Cumberland that desires telephone service.

BELLA COOLA, B. C., CAN.—B. F. Jacobson, of this town, is endeavoring to arrange for the construction of a local and rural telephone company.

WINNIPEG, MAN., CAN.—The Manitoba Telephone Commission has given notice that all conversations by night which have been arranged for over the lines of the commission during the day will be charged for at day rates.

WINNIPEG, MAN., CAN.—Arrangements are now being made with the Saskatchewan government to connect the telephone system of that province with the Manitoba system. The connecting point will be on the boundary a few miles east of Sinclair, Man. Negotiations are also in progress to connect the government systems of Saskatchewan and Alberta whilst the newly formed Kootenay Telephones, Ltd., has announced its intention of securing connection with the Alberta system on the boundary between connection with the Alberta system on the boundary between Alberta and British Columbia. This will enable Winnipeg to talk with British Columbia.

WINNIPEG, MAN., CAN.—The Manitoba Telephone Commission is now preparing a list of the supplies required for the coming year when a number of extensions to the government system will be made. Orrin F. French is chief engineer.

WINNIPEG, MAN., CAN.—The Manitoba Telephone Commission is discussing with American telephone companies south of the international boundary a revision of the rates for long distance messages to American points.

WINNIPEG, MAN., CAN.—Robert Rogers, minister of public works of the Manitoba government, has announced that the profits of the government telephone system this year will be $200,000. After Jan. 1 the rates will be cut in half.

BRANTFORD, ONT., CAN.—The Bell Memorial Association has announced that the former homestead of Professor Alexander Graham Bell, inventor of the telephone, will be acquired as a public park in addition to the erection of a memorial monument to cost $25,000. This monument will be unveiled in 1910.

PORT ARTHUR, ONT., CAN.—The city commissioners have decided to raise the telephone rates under the municipal system from $1.00 and $2.00 per month to $1.25 and $2.50 per month for residence and business telephones, respectively. The commissioners have found this necessary as the system does not pay under the present rates. The commissioners have also asked Fort William to raise the rates to the same figures.

UNDERGROUND.

OTTAWA, KAN.—A petition is being circulated requesting the council to require the telephone company to put its wires underground in the business district.

SHAMOKIN, PA.—The Bell Telephone Company, of Pennsylvania, has presented a petition to the city council requesting permission to lay conduits for placing its wires underground.

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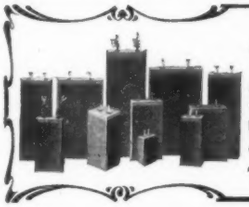

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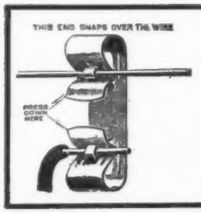

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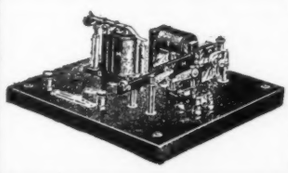

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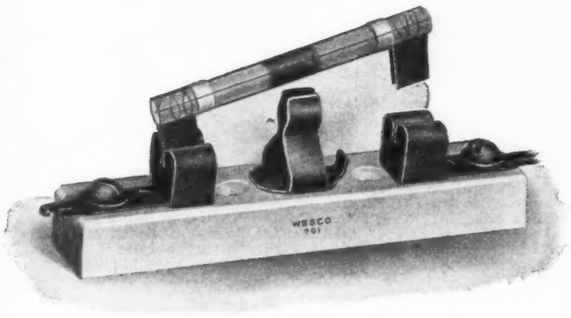

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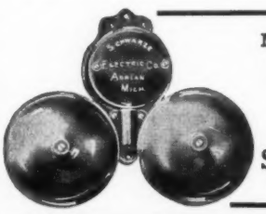


Magneto LOUD RINGING Extension

Telephone Bells

Size of gongs, 2½ in. to 10 in. All resistances. All weather proof. Efficiency, durability and price will interest you.

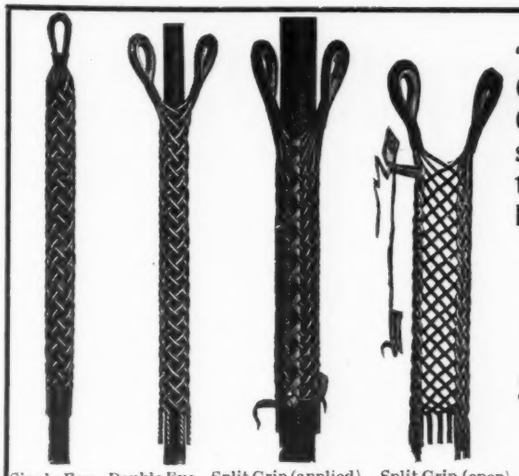
Schwarze Electric Company
Main Office and Factory: Adrian, Mich.

TELEPHONE EAR CUSHION Cuts Off All Outside Noises

Samples FORTY CENTS, Prepaid

This pneumatic cushion is made of the softest rubber and can be adjusted to the hard gutta-percha receiver very readily. The cushion conforms to the exact shape of the ear as such an air pad alone could, cutting off outside noises and giving the ear a comfortable cushion instead of a rigid receiver. Holds the ear-drum further from the receiver, and by virtue of the air and flabby rubber cushion it neutralizes the harsh crash! crash! noises.

Made by
HURON RUBBER COMPANY, CLEVELAND, O.



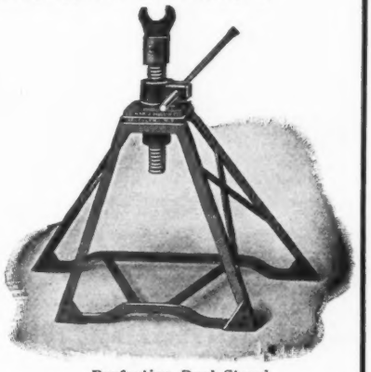
"Mul" Cable Construction Devices

"Gem" Wire and Cable Grip save their cost in the first pull

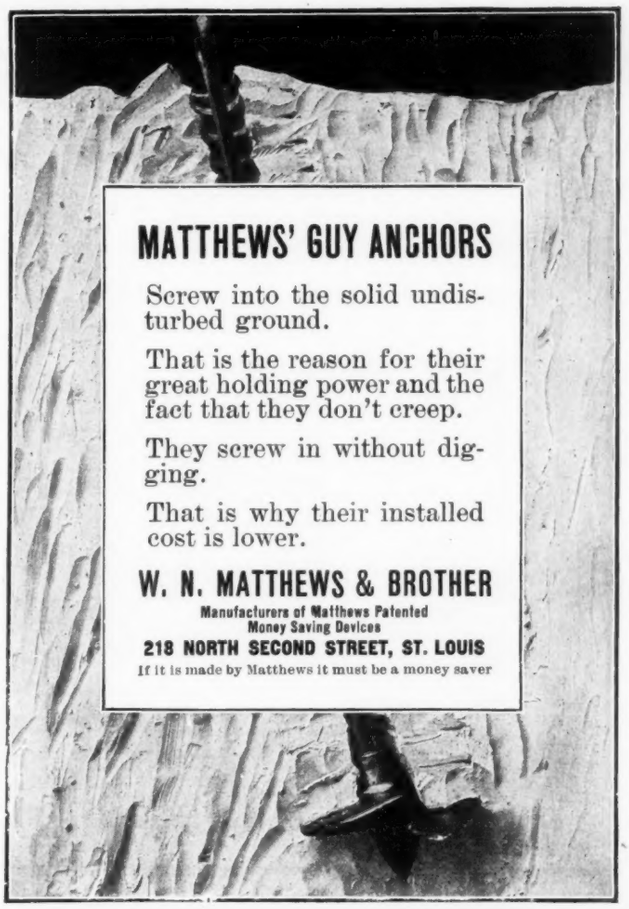
Single Eye. Double Eye. Split Grip (applied). Split Grip (open).

Colman J. Mullin
430 Kent Ave.
Brooklyn, N. Y.

MUL



Perfection Reel Stand



MATTHEWS' GUY ANCHORS

Screw into the solid undisturbed ground.

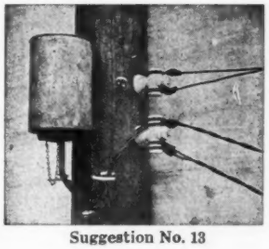
That is the reason for their great holding power and the fact that they don't creep.

They screw in without digging.

That is why their installed cost is lower.

W. N. MATTHEWS & BROTHER
Manufacturers of Matthews Patented Money Saving Devices
218 NORTH SECOND STREET, ST. LOUIS
If it is made by Matthews it must be a money saver

Read It!
Mr. Telephone Manager
Bulletin 18 Read It!
"Effect of Cold Weather on Dry Cells"
Also bulletins 15, 16 and 17. They will help you in your business.
French Battery & Carbon Co., Madison, Wis.
Makers of Fleur de Lis Dry Cells



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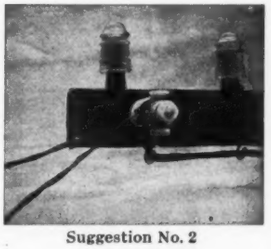


Suggestion No. 2

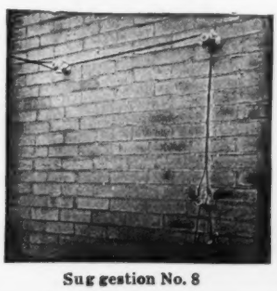
Universal Insulators

SOME ADVANTAGES:
Low first cost.
Cheaper than iron or wood brackets—Easily attached—
Labor Saving.—A separate groove for each wire—
Grooves for all directions.
Reduced maintenance.

Write for Descriptive Literature

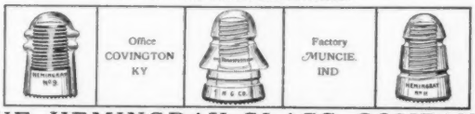
Universal Specialty Company
116 S. Seventh St. Terre Haute, Ind.

Suggestion No.5

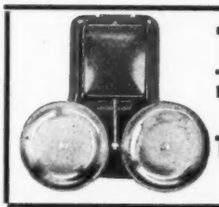


Suggestion No. 8

The STANDARD "HEMINGRAY"
ALL WITH THE "PATENT DRIP PETTICOATS"



THE HEMINGRAY-GLASS COMPANY
ESTABLISHED 1848



This is a Noisy One
Even a boiler shop cannot provide noise enough to drown it. Wound for all standard resistances
THE HOLTZER-CABOT ELEC. CO.
Chicago, Ill., and Boston, Mass.

POLES

Awaiting orders for rush shipments at Hawthorne Yard

DULUTH LOG CO.

GENERAL OFFICES:

DULUTH, Second Floor, Palladio Building, MINNESOTA

Cedar Poles

LARGE BUTTS

We cut poles from lands owned by our Company in Northern Michigan on Lake Superior Shore, where the cedar is very **sound** and **stocky** with **heavy butts.**

All sizes in stock all the year round.

Write for a Copy of Our Telegraph Code for Cedar Products Giving Valuable Information About Poles.

C. H. WORCESTER CO.

1708-1710-1712 Tribune Bldg.

CHICAGO, ILL., U. S. A.

White Cedar

POLES

POLES

POLES

LARGE STOCK—14 to 65 ft.

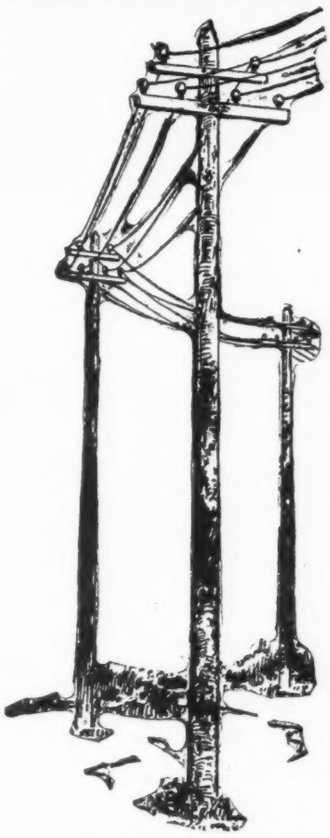
Prompt Shipment

FRANCIS BEIDLER & CO.

CHICAGO, ILL.

YARDS:

Marinette, Wis. Escanaba, Mich. Superior, Wis.



National Pole Company

Escanaba, Michigan

Successor to the Cedar Department of the

PITTSBURG & LAKE SUPERIOR IRON CO.

Producers and Shippers of

CEDAR POLES

From the Stump to the Line

We carry large stocks of Poles at various points in the States of Michigan, Wisconsin, Minnesota, Idaho, Washington and Maine, and are in position to make immediate shipments at lowest prices and freight rates.

THERE IS NO DOUBT in our minds that one trial order will convince you absolutely that

Bissell Idaho & Michigan Cedar Poles

are the very best on the market, and that better prices cannot be had. After you've ordered once, we'll get all your business, as a matter of course.

Leaflet No. 6 makes some things clear

THE F. BISSELL COMPANY
TOLEDO, OHIO

TOLEDO, OHIO THE F. BISSELL COMPANY

IN 24 TO 48 HOURS

FROM RECEIPT OF YOUR ORDER WE CAN SHIP, FROM OUR YARDS AT MINNESOTA TRANSFER, EITHER NORTHERN WHITE OR IDAHO RED.

CEDAR POLES

Pagers Hill Co.

MINNEAPOLIS
MINNESOTA

POLES

NORTHERN WHITE CEDAR

Give best service. Our prices are lowest. May we quote?

ITASCA CEDAR COMPANY, Deer River, Minn.

100,000 WHITE CEDAR POLES

BACKUS-JUDD LUMBER AND COOPERAGE CO.

MINNEAPOLIS, - - - MINNESOTA

Geo. M. Griffen Lumber Co.

Oriel Bldg., St. Louis, Mo.

CYPRESS POLES AND PILING From 5"—25' to 8"—70'

Prompt Deliveries - - - Write for Prices

C. J. HUEBEL COMPANY

Room 2, Schale Block, Menominee, Mich.

Michigan White Cedar Poles

Idaho Cedar Poles—all Lengths

Yards: Menominee, Mich.; Nathan, Mich.; Stager, Mich.; Swanson, Mich.

WESTERN CEDAR POLES AND RED FIR CROSS ARMS

THE LINDSLEY BROTHERS COMPANY, SPOKANE, WASH.

EASTERN SALES OFFICE
MONADNOCK BLOCK, CHICAGO, ILL.

WE PRODUCE OUR OWN POLES AND MANUFACTURE OUR CROSS ARMS

We are Seeking

a market for our annual output of WHITE CEDAR POLES.

You are Seeking

that producer whose stock is manufactured right—prices reasonable and who can give special terms when you require such.
We are always willing to do what you require of us. Just write us once.

McCulloch and Moss Lumber Co.
311 Lumber Exchange, MINNEAPOLIS, MINN.

PRODUCERS *WHOLESALERS*

STRICTLY HIGH GRADE

White Cedar Poles

Yards in Minnesota
Quick shipments anywhere in United States

Deer River Lumber Co.
Minneapolis, Minn.

Michigan White Cedar POLES
WILL OUTLAST ALL OTHER KINDS

GET OUR PANIC PRICES. We can fill all sized orders from our own stock 150,000 ON HAND. Twenty-eight years have we been producers.

W. C. STERLING & SON CO.
Principal Office: MONROE, MICHIGAN
Yards: Bay City, Omer, Boyne Falls, Cass City and Monroe

DOTY LUMBER AND SHINGLE CO.

Manufacturers of
Washington Fir
Cross Arms. Red
Cedar Poles and Piling
In any Length
PROMPT SHIPMENTS
Doty, Washington

BUY NOW Big Stock Low Prices Quick Delivery **CEDAR POLES**

There'll never be a better chance than now.

KRUEGER & GRANT LUMBER CO.
MINNEAPOLIS, MINNESOTA

PARKER-KENRICK CEDAR CO.
CEDAR POLES
Posts and Ties 349-351 Security Bldg.
MINNEAPOLIS, MINN.
WRITE US FOR PRICES

WHITE CEDAR POLES
Producers and Wholesalers Prompt Shipments
Standard Cedar & Lumber Co.
34 SECURITY BANK BLDG., MINNEAPOLIS, MINN.

SPECIAL PRICES
on 6"-25's and Longer
WHITE CEDAR POLES
L. K. Deal Lbr. Co.
900 Clapp Blk., Des Moines, Ia

OLDEST QUALITY OUR MOTTO
CEDAR POLE CONCERN.
IN THE BUSINESS
IMMENSE STOCKS—ALL SIZES AND LENGTHS
·ESTABLISHED 1862·
WM. MUELLER COMPANY
MAIN OFFICE
BLANEY, MICH.

WE MAKE LOW PRICES ON

Idaho Red Cedar Poles

Michigan White Cedar Poles

8 YARDS IN IDAHO—2 IN MICHIGAN

Western Lumber & Pole Co.

Main Office Charles Bldg., Denver, Colo.

White Cedar Poles

Being producers we can save you jobbers profits.

Yards in Minnesota, Wisconsin, Ontario and Manitoba. Quick shipments anywhere in United States or Canada.

T. M. Partridge Lumber Co.

Minneapolis, Minn.

CEDAR TELEPHONE & TELEGRAPH POLES

Marshall H. Coolidge Company

OFFICE

826 Guaranty Building, Minneapolis, Minn.

We produce our own stock! Know the requirements of the trade! Have six large yards and several smaller ones! Can make prompt shipments of any lengths from 16 to 60 feet

These Facts Ought to be Worth Your Attention When Buying Poles!

PENDLETON & GILKEY

MINNEAPOLIS, MINN.

Producers of everything in Cedar

CEDAR POLES

All Sizes — Large Stock
Low Prices — Prompt Shipments

YARDS:

Mountain, Wisconsin **Oconto, Wisconsin**

Telephone Engraving

is in a class by itself. Any artist can draw a picture or something NEARLY LIKE the real thing.

But it requires an artist with a TECHNICAL KNOWLEDGE of a TELEPHONE and its CONSTRUCTION to produce a proper illustration of it, or of telephone appliances.

In other words, he must be not only artist but MECHANIC.

We have made TELEPHONE ILLUSTRATING a study.

"WE'VE BEEN AT IT FOR YEARS."

Write us in YOUR OWN TECHNICAL WAY.

WE'LL KNOW WHAT YOU ARE TALKING ABOUT.

All Engravings in this Magazine were made by

DEARBORN ENGRAVING CO.

ARTISTS : ENGRAVERS : PRINTERS

1322 Wabash Ave., CHICAGO, ILL.

JOHN H. FOWLER & CO.

CEDAR AND CYPRESS **POLES** TIES POSTS PILING

1415 Fisher Building Chicago

There is a reason for the popularity of the EVERSTICK ANCHOR.

Can't you see it?

Write for prices.

The Everstick Anchor Co.

ST. LOUIS, MO.

POLES From stump to consumer. A full assortment of sizes.

KAYE & CARTER, Minneapolis, Minn.

WHITE CEDAR POLES Complete Stock All Sizes

Get my prices before buying GEO. HARDING, Deer River, Minn.

CEDAR POLES

HALL BROOKS CO., Tomahawk, Wis.

Producers **CEDAR POLES**

DREGGE-GROVER LUMBER CO.

Cedar Yards { Ozark, Mich. / Spur 461 Soo Line } General Offices { Grand Rapids, Mich.

THE K. B.
LOCKOUT SYSTEM
Will save you Money. The best and most economical System on the Market. Write for descriptive Circulars and further information.
THE DAYTON TELEPHONE LOCKOUT MFG. CO.
DAYTON, OHIO

Jewell Meters
For Wire Chiefs' Desk
These instruments of the highest grade and moderate in price. It would pay you to investigate. Catalogue upon application.
JEWELL ELECTRICAL INST. CO.
61 N. Ashland Ave., : : Chicago

TYPE C 25 VOLTMETER
Diameter of Face, 2 1-2 in. Overall Diameter, 3 in.
D'Arsonval Type
Accurate; dead beat; fully guaranteed. Sent on 30 days' approval. Made in the following ranges: Ammeters, 1-100 ampere to 30 amperes. Voltmeters, 1-100 volt to 25 volts.
Price, $7.50 and upwards
Ask for Bulletin A7
Hoyt Electrical Instrument Co.
Penacook, N. H.

Dealer in Independent Telephone Bonds and Securities. Publisher of Swartz' Telephone Siftings. 25 cents a year. Address
IRA T. SWARTZ
Office 201 New Oddfellow Building--Lock Box 423
INDIANAPOLIS, IND.

CLASSIFIED ADVERTISEMENTS

And want advertisements not exceeding twenty words, exclusive of address, will be inserted in these columns for $1.00 each. For over twenty words, the rate will be 5 cents per word.

WANTED TO BUY—Two or three telephone and electric light plants in North Dakota or Northern Minnesota. Frank E. Corson, Rooms 3, 4 and 5, Magill Block, Fargo, N. Dak.

WANTED—Wire chief. Must be thoroughly experienced in common battery automatic apparatus. Give references, salary, etc. Cass County Home Telephone Company, Dowagiac, Mich.

WANTED—Wire chief's assistant, thoroughly experienced in common battery switchboard and instrument repairs, difficult trouble work and capable splicing. Technical education preferred. Give experience, reference, salary, married or single. Address No. 546, care TELEPHONY.

POSITION WANTED—Thoroughly competent telephone trouble man having experience in Independent and Bell fields; understands switchboard installing and circuit work thoroughly. Executive ability. Eight years' experience. Married man. Address A. H. Morgan, 4155 Langley Ave., Chicago, Ill.

FOR SALE—700 second-hand American Express switchboard drops; 100 American Express Bell style drops. All series. Price 75c each. Old Kentucky Telephone & Telegraph Company, Winchester, Ky.

INTERNATIONAL CORRESPONDENCE SCHOOL Telephone Engineering Course for sale. Cost $71.00; will sell for $45.00. This course is complete. Address No. 553, care TELEPHONY.

CHEMICAL ENGRAVED NAME PLATES and drop numbers. Steel stamped letters and figures. Send for samples and prices. C. H. Hanson, 44 Clark St., Chicago.

COMPETENT TELEPHONE MAN, now employed, desires change of location as manager or superintendent of one or more exchanges. Good reference. Address No. 550, care TELEPHONY.

"GREAT THINGS FROM SMALL BEGINNINGS GROW"—You men of modest means who are interested in telephone work: We can acquaint you with details concerning one of the best opportunities of the day. A successful, growing, manufacturing business, where you can buy stock which is bound to largely increase in the immediate future. Fullest investigation courted. Best of references from well-known telephone men. Address "Opportunity," care TELEPHONY.

POLES White or Red Cedar, any length
Ask for delivered prices
FARIS & MAYHEW LUMBER & POLE CO., Denver, Col.

Insulated Staples

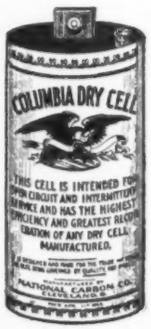
5 Sizes
Pat. Nov. 1900

BLAKE
TUBE FLUX for SOLDERING
Full Size of Tube, 1" x 5"

Patented Feb. 4, '08
COMPRESSED CLEATS
FOR USE ON PLASTERING

EXACT SIZE
PAT. JULY 1906
BLAKE SIGNAL & MFG. CO. WRITE FOR SAMPLES 246 SUMMER ST., BOSTON, MASS.

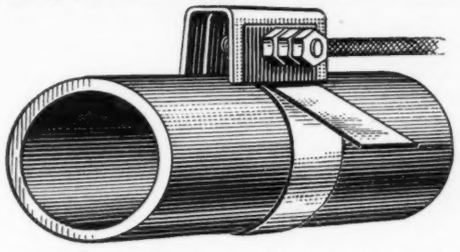
DO YOU WANT WHAT'S DUE YOU?
THEN INSTALL **GRAY PAY STATIONS** AND YOU'LL GET IT
All details are in Catalog No. 50. Write for a copy.
GRAY TELEPHONE PAY STATION CO., Hartford, Conn.



YOU WILL RECEIVE
MORE ACTUAL SERVICE VALUE from a dollars worth of COLUMBIA batteries than you will from a dollars worth of ANY OTHER KIND. Their use means LOWER OPERATING EXPENSES—MORE PROFIT FOR YOU.
No Extra Charge for Fahnestock Connections
NATIONAL CARBON CO. CLEVELAND, O.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

The Improved Vogel Ground Clamp



Your name and address on a postal will bring samples

Fairmount Elec. & Mfg. Co.

2320 Market Street, - z - Philadelphia, Pa.

FRANKEL'S ELECTRIC TESTING CLIPS

SHORT CUTS FOR TROUBLE HUNTERS

You need not waste time baring the wire

Constructed to test any size line

Patented Nov. 15, 1904, and Foreign Countries

Sample Dozen,	12½	Cents	Each
100 Lots	11	"	"
500 "	10	"	"
1000 "	9	"	"

The teeth grip the line or binding post. The pin pierces the insulation and makes a perfect test connection.

From Your Supply House or

FRANKEL DISPLAY FIXTURE CO.

733-735 BROADWAY NEW YORK, U. S. A.

COPE'S PATENT CABLE RACK

and Conduit Rods

FOR MANHOLES, VAULTS AND DUCTS

Cheapest, strongest and most convenient CABLE RACK made. Costs but little more than wood and is indestructible, more durable and convenient. Made in all sizes.

CONDUIT RODS are made in 3 and 4 foot lengths. Quickly coupled and uncoupled, they are the best rod on the market

T. J. COPE *ENGINEER AND CONTRACTOR* 3244 North 15th St., PHILADELPHIA, PA.

Manufacturer of all tools appertaining to Underground Construction. Write for catalogue describing Cope specialties.

WILLIAMS TEST CLAMPS

Will pay you a fine profit in the saving of labor and material. They save skinning—they save re-taping—they save time—they save the wire. Send 75 cents for a pair (two), postpaid, on 30 days' trial. Your money back if you want it.

THE WILLIAMS TEST CLAMP CO.

720 Electric Bldg. Cleveland, O.

Increased Revenues and Pleased Subscribers

where Connecticut Automatic Intercommunicating Telephones are used. **Non Interfering Trunk Buttons** absolutely disconnect the local system when any instrument is used for exchange calls. Catalog 10-T gives full details. Free upon request.

CONN. TELEPHONE AND ELECTRIC COMPANY, Inc.

MERIDEN, CONN.

Universal Test Set

RAPID TESTING

ACCURATE LOCATIONS

Let us equip your present Voltmeter with a set of shunts and scale so you can measure low and high resistances, quickly and accurately without calculations.

WRITE FOR DESCRIPTIVE MATTER

Middleton Bros. Electrical Testing Instruments **1361 Monadnock, Chicago**

COPPER-CLAD STEEL WIRE

Twisted Pair Drops of No. 17 B. & S. will not corrode at cable box as does iron

CARRIED IN STOCK AT CHICAGO, ST. LOUIS, FORT WORTH

MANUFACTURED BY

Duplex Metals Co., 208 Fifth Ave., New York

American Electric Telephone Co., Chicago

We Issue the Following Bulletins and Send Them Postpaid

Bulletin No. 10—American Express Switchboards.
" " 11—Desks—Toll and Private Branch.
" " 12—Visual Signal and Bell Style Switchboards.
" " 13—Intercummunicating Systems.
" " 14—**Line Material and Supplies.**
" " 15—Bell Express Self-Restoring Switchboards.
" " 16—Operator's Set and Accessories.
" " 17—Parts of Apparatus.
" " 18—Magneto Telephones of all Kinds.

INDEPENDENT LOCAL AND LONG DISTANCE TELEPHONE

Bulletin No. 19—Common Battery Switchboards.
" " 20—Common Battery Telephones.
" " 21—Protective Apparatus and Terminal Equip't.
" " 22—**Construction of Country Telephone Lines.**
" " 23—Eight-Party Selective Ringing Telephones.
" " 26—Telephone Power and Ringing Equipment.
" " 27—**Spanish Edition, Complete Catalogue of Apparatus.**
" " 28—**Burns Express Type 45 Magneto Switchboard.**
" " 29—4-Party Harmonic Selective Telephones.

Special Bulletin No. 360 describing the No 360 compact Magneto telephone; Special Bulletin No. 48 describing common battery pressed steel telephone; Special Bracket bulletin describing Burns Adjustable Telephone Bracket.

RUBBER COVERED WIRES AND CABLES

For all Classes of HIGH-GRADE ELECTRICAL SERVICE

42 Broadway, New York
N. I. R. Wires and Cables carried in stock by the MONARCH ELECTRIC & WIRE Co., Chicago, Ill.

NATIONAL INDIA RUBBER CO. BRISTOL, R. I.

Klein's New "Chicago Grip"

No. 358A for No. 6 Wire and Smaller

is made of steel forging, polished and nickel plated. It is a well-proportioned and reliable tool. The draw link is arranged so it does not fall in the way of the wire. It holds fast on iron or copper wire. Do not fail to have our Catalog on file. It is arranged with Code and List numbers for convenient ordering. All prominent supply houses carry our products.

See our Exhibit at the Electrical Show January 16th to 30th, 1909

MATHIAS KLEIN & SO
87 W. Van Buren St. Chicago, Ill.

SIMPLEX

FOR SUBURBAN **Underground Connections**
USE
Steel Taped, Lead Covered Cables
No Conduit
Quickly Installed
Few Joints

INSULATED **WIRES and CABLES**
RUBBER — CAMBRIC
THE SIMPLEX ELECTRICAL CO - BOSTON

Do You Realize

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